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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of March and April 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

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FIRST PART.  
ORIGINAL ARTICLES

**The Administrative Measures taken in Holland  
in Favour of Cattle Breeding**

by

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Whilst the measures adopted by the governments to further the breeding of horses are regulated by a special law (Law of 1901 on horse breeding), it is not the same with those for cattle.

Already in 1809, under king Louis Napoleon, a law was enacted on the selection of bulls which forbade putting at the disposal of the public non-approved bulls, but it was not applied on account of the troublous times then prevailing. After the reestablishment of the independence of the country, ordinances were issued by the various provinces, with the encouragement of the Government, on the selection of bulls, but they were gradually abrogated because it was thought that the improvement of cattle might be safely entrusted to the farmers themselves.

Under the influence of the agricultural crisis which was felt in Holland at the end of the nineteenth century, a change in public opinion took place by degrees, and the Government was urged to abandon its passive attitude and to take in hand the agricultural interests.

Several provincial administrations had already set the example. Thus North Brabant had re-introduced the compulsory approvation of bulls, with a system of bounties; the province of Limburg followed this example in 1890. The other provinces placed at the disposal of the administration subsidies to be granted to the best bulls. These precedents induced the Central Government to appropriate a sum of 30 000 florins (£ 2 500) in the 1897 budget, for the encouragement of cattle breeding. Since then the above sum has been gradually increased.

At present the budget of the State includes every year appropriations for the following objects:

- a) Grants to associations possessing a herd-book.
- b) Grants to provincial commissions for the improvement of cattle.

- c) Nomination of experts in the matter of breeding
- d) Institution of courses for the improvement of stables.
- e) Subsidies to national shows.

#### A. *The Herdbooks in Holland.*

There are two great associations in Holland which possess herdbooks; one is that of the Netherland Cattle Herdbook (Nederlandsch Rundveestamboek), and the other that of the Friesian Herdbook (Friesch Rundveestamboek). They receive every year from the Government grants of 15 000 florins (£ 1 250) and 7 000 florins (£ 583) respectively. There are also two other less important associations having mostly local interest and which are not in receipt of Government grants.

The Netherland Cattle Herdbook dates back from 1873; it includes the three following: The Black-and-White Holland breed, the Brown-and-White Yssel and the Black-Whitehead Groningen. To a certain extent this Herdbook may be considered as the fusion of three separate herdbooks. A General Direction at the Hague issues the regulations to be followed by the three herdbooks. This federation aims at favouring the creation of breeding associations, by giving them the possibility of registering in the herdbook, obliging them at the same time to submit their statutes, regulations and instructions for the keepers of the bulls and for the milk control assistants to the approval of the directors of the herdbook.

At the end of 1912, fifteen associations formed part of the Netherland Cattle Herdbook, and there is every reason to believe that this number will increase considerably in the future.

The Friesian Herdbook dates from 1879. It deals only with Friesian cattle, and registers only the Black-and-White and Brown-and-White Friesian animals. The Friesian Herdbook Association works in intimate touch with the provincial commission for the improvement of cattle. The central examinations of bulls are carried out by the Friesian Herdbook Association. The surveillance of the work of the milk control assistants, of the breeders' associations and of the control associations is effected by the Control Commission of the Friesian Herdbook Association, in which the milk expert of the province has a seat.

In order to be entitled to a grant the bulls must be registered in the herdbook.

The registers of the herdbook already contain 4151 bulls and 12 993 cows, or a total of 17 144 head. In the printed herdbook, the performances of the 6 500 cows under milk control are given; 31 Friesian breeders appear as having all their cattle registered in the herdbook.

#### B. *Bounties granted by the Central Government to the Provincial Commissions for the Improvement of Cattle Breeding.*

The manner of using the government and provincial grants is settled by the «Regulation on government subsidies for cattle breeding». The

first regulation was issued in 1897; the grants were at first exclusively devoted to the awarding of prizes for bulls. But the opinion steadily gained ground that it was not enough to bestow prizes only on bulls, but that the cows also should be taken into consideration. The most practical manner of attaining this object was to encourage the spirit of association among breeders, which gives rise to breeding associations, to associations for buying breeding animals in common, and to control associations. These considerations led to a modification of the general regulations which was effected in 1907.

At present in each of the eleven Dutch provinces the members of the Permanent Commission of the Provincial States appoint a commission for the improvement of cattle, after having consulted the agricultural associations of the province and the herdbook associations designated by the Minister of Agriculture, Industry and Commerce. The cattle expert, the milk expert and the provincial professor of agriculture have seats in this commission as advisers, but do not vote.

These provincial commissions have to draw up a regulation for the distribution of the government and provincial grants and bounties, to appoint one or more examining commissions, and to administer and distribute the sums devoted to grants and bounties.

The Minister of Agriculture, Industry and Commerce appoints one member to each of these commissions.

Every year before the 1st of March the provincial commission sends to the Minister: *a*) a statement of the sums placed at its disposal by the Government; *b*) a brief report giving an exact statement of the condition of cattle breeding in the province during the past year; *c*) a proposed budget for grants and bounties to be approved by the Minister.

At first the government and provincial grants were almost exclusively devoted to making up bounties for bulls, which were awarded according to their external characters, but gradually their pedigree and the quality of their offspring were taken into account.

In 1911 the provincial commissions received from the government and from the provinces the following grants.

Provinces	Government grants			Provincial grants		
	£	s	d	£	s	d
Groningen . . . . .	258	6	8	208	0	8
Friesland . . . . .	529	3	4	460	0	0
Drenthe . . . . .	333	6	8	166	13	4
Overijssel . . . . .	368	6	8	125	0	0
Gulders . . . . .	500	0	0	1000	0	0
Utrecht . . . . .	370	16	8	375	0	0
North Holland . . . .	500	0	0	416	13	4
South Holland . . . .	491	13	4	607	1	8
Zenland . . . . .	250	0	0	250	0	0
North Brabant . . . .	366	13	4	625	0	0
Limburg . . . . .	258	6	8	166	13	4
Total	£ 4226	13	4	£ 4400	8	4

About 60 000 florins (£ 5 000), or about two-thirds of the total sum placed at the disposal of the provincial commissions by the government and the provinces, were distributed as bounties for the bulls presented to the examination commission. These examinations are divided into local, district and central examinations.

The local examinations precede the district examinations; they are held in localities easily accessible to breeders, and in them the animals which may compete for the district bounties are picked out. The central examinations are held in several provinces and concern the animals that have received bounties in the district examinations. They form at the same time markets for breeding animals and as such are highly appreciated by farmers.

Certain provinces (Groningen, Utrecht and Drenthe) award bounties to cows also, but these examinations of cows have not yet developed much, because it has been understood that the object was better attained by subsidizing the breeding associations. Accordingly the activity of the provincial commissions was more and more directed to the development of the spirit of association among breeders, and this movement is unceasingly spreading. The mode of distributing the grants varies from one province to another. In some places a fixed yearly sum is allotted, in others the grant consists especially of high bounties for the association bull.

The control of the subventioned associations for the purchase in common of breeding animals follows certain fixed regulations, which deal with the milk control of the cows registered in the books of the breeding associations, the manner of keeping the pedigree books, the declaration of the birth of the calves and the care of the bulls.

In Friesland, where cattle breeding is highly developed, there are only five breeding associations, and the whole of the province may be considered as one great breeding association, having as a central register the Friesian Herdbook.

In this province the milk control is effected by assistants who depend from the cooperative dairies.

In the other provinces this control is entrusted to special assistants, and the dairy experts play a very important part, both in instructing the assistants and in controlling their work.

The Netherland Herdbook assists also as much as possible in the formation of breeding associations, by admitting well constituted associations and affording them pecuniary and moral assistance.

In five provinces (North Holland, South Holland, Friesland, Zealand and North Brabant) the breeding and the control associations have grouped themselves into provincial federations having special statutes and a council of management, the members of which are elected by the federated associations among their members.

The associations for the purchase in common of breeding animals and the control and breeding associations at present existing are the following:

	Associations for the purchase in common of breeding animals	Control associations	Breeding associations
	—	—	—
North Brabant	1	—	23
Guelders . . .	23	5	31
South Holland .	8	—	27
North Holland	—	—	23
Zealand . . . .	21	12	—
Utrecht . . . .	—	1	15
Friesland . . . .	56	90	5
Overijssel . . .	19	2	10
Groningen . . .	—	3	7
Drenthe . . . .	43	—	5
Limburg . . . .	43	—	2
Total	217	116	118

*C. Breeding Experts, Dairy Experts, Government Professors of Agriculture.*

In each of the 11 provinces there is a professor of agriculture and a dairy expert appointed by the Government; in three of the provinces there are also breeding experts. Breeders owe a good deal to the influence of these officials, who have taken a special interest in the organisation of agricultural and breeding associations and who have contributed by their zeal to the foundation of a great number of associations for the purchase in common of breeding animals and of others for control and for breeding.

The milk control has been greatly facilitated by the support of the dairy experts, who, thanks to their courses on the examination of milk, have formed a competent staff for milk control and breeding associations; besides which they have freely opened their laboratories for the examination of milk. But as their task was a heavy one, the Government recognized the necessity of appointing special officials or breeding experts who could devote themselves wholly to the improvement of cattle. The two first breeding experts were appointed in 1908 and the Government proposes increasing their number as soon as capable officials can be formed.

*D. Stable Competitions.*

Thanks to the cooperation of the dairy and breeding experts, the agricultural associations and the cooperative dairies organize every year competitions for the improvement of stables. There are at present in the various provinces special commissions which manage and watch over these competitions. They are composed of some practical farmers, of one or more of the above-mentioned officials, sometimes of a veterinary surgeon and of a representative of the institute for agricultural machinery and rural constructions attached to the Higher School of Agriculture, Horticulture and Forestry of Wageningen.

Most of these stable competitions are subventioned by the Government and are subject to special regulations. They have been very useful, especially in backward districts, as they have materially assisted in bringing about such improvements as were necessary from a hygienic point of view, and indispensable for obtaining a good production of milk.

### *ii. Live Stock Census.*

The Government makes a census of live stock at determined dates. The last was taken between May 20 and June 10, 1910. It showed that there were then in Holland 2 026 943 head of cattle against 1 690 463 in December 1904, namely an increase of 336 480, or 20 per cent.

The cattle are distributed as follows in the various provinces :

Number of cattle per 100 acres of arable land, pastures and gardens	Number of cattle per 1000 inhabitants
1. Utrecht . . . . . 55.8	Friesland . . . . . 815 head
2. S. Holland . . . . . 51.4	Drenthe . . . . . 556 "
3. Friesland . . . . . 46.1	Overijssel . . . . . 176 "
4. N. Holland . . . . . 41.7	Utrecht . . . . . 159 "
5. Guelders . . . . . 39.3	Guelders . . . . . 143 "
6. Overijssel . . . . . 37.2	N. Brabant . . . . . 161 "
7. Limburg . . . . . 32.6	Zealand . . . . . 363 "
8. Drenthe . . . . . 32.8	Groningen . . . . . 322 "
9. N. Brabant . . . . . 32.4	Limburg . . . . . 314 "
10. Zealand . . . . . 22.7	S. Holland . . . . . 222 "
11. Groningen . . . . . 22.3	N. Holland . . . . . 185 "
General average <u>36</u>	General average <u>348 head</u>

### *F. Measure adopted to favour the Exportation of Cattle.*

In order to afford foreign importers of Dutch cattle the greatest security as to the sanitary conditions of the cattle intended for exportation, the Government issued on September 11, 1908, a Royal decree dealing with the examination by a veterinary surgeon of breeding cattle intended for exportation. The veterinary delivers a certificate which declares that the animals are free from any contagious disease. The chief of this inspection service, which includes examination for tuberculosis also, is the Director of the Rotterdam Government Institute for the preparation of serums. The veterinaries entrusted with the inspection are expressly appointed by the Government.

Belgium is the country which purchases the greatest number of cattle from Holland (mostly animals for the butcher, but also milch-cows). Germany and England do not allow the importation of live animals, but the exportation of the meat for those countries is very considerable. The demand from abroad for Dutch breeding cattle is always increasing: they are exported at high prices to Italy, Spain, Portugal,

France, Austria, Galicia, Russia, Sweden and also to South Africa, Brazil and Japan.

Of late years the foot-and-mouth epidemics have rendered exportation much more difficult. In 1909, a year which may be considered as normal, the exportation of live cattle was about 109 000 head.

### G. Shows

Every year agricultural shows, at which cattle occupy an important position, are held in Holland. They are frequently organized by agricultural associations and have a provincial or rather local character.

It is proposed now to hold at fixed dates agricultural exhibitions which will be organized by the Royal Netherlands Agricultural Society. They will not only give an idea of the various branches of agriculture in Holland, but will also serve purposes of demonstration and education.

The first great national show of this year will be held at the Hague from September 13 to 16. It promises to be very interesting, and it will receive from the Government an appropriation of £ 25 000.

## The Poultry Industry in Great Britain

by

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To voluntary effort must be mainly attributed the great development made in respect of the Poultry Industry within recent years, rather than to the support accorded by State and local authorities. The time has arrived, however, when the last named are undertaking responsibilities for promotion, teaching and organisation of Poultry-keeping as an economic pursuit, which may profoundly affect future production, equally as to quality and volume. It is now recognised that instruction, investigation, research and organisation are public services that cannot be left to the initiative of individuals or private bodies, more especially as those to whom we must look for increased production are mainly smaller farmers and occupiers. As evidence of this fact may be cited the relative number of poultry kept per 100 acres of cultivated land in 1908 in relation to the size of holding, as published by the Board of Agriculture and Fisheries, the result of a Census taken in the year named.

Area				No. of Poultry		
Above	1 acre and not exceeding	5 acres	1041 per 100 acres			
"	5	"	50	"	272	"
"	50	"	300	"	88	"
"	300 acres	.	.	.	1	"

Thus the farmers under five acres had *pro rata* to the size of their holdings 25 head of poultry for every one on farms of 300 acres and upwards. Such is a very suggestive fact, one which explains why a much greater production is looked for where small holdings at present exist or increase in number.

The last poultry census referred to above was taken in June, 1908, and the total figures published include both old and young birds. The totals given are as in Table I.

TABLE I.

*No. of Poultry in Great Britain (1908) and Comparisons  
per Thousand Acres of Cultivated Land.*

Country	Fowls		Ducks		Geese		Turkeys		All Poultry	
	Number	Averages	Number	Averages	Number	Averages	Number	Averages	Number	Averages
England . .	25 952 000	1 057.0	2 395 000	97.5	494 000	20.1	541 000	22.0	29 392 000	1 196.7
Wales . . .	2 287 000	820.5	274 000	98.3	192 000	68.8	87 000	31.2	2 840 000	1 019.0
Scotland . .	4 107 000	844.5	294 000	60.4	26 000	5.3	69 000	14.2	4 496 000	924.5
Great Britain	32 356 000	1 004.0	2 963 000	91.9	712 000	22.1	697 000	21.6	36 728 000	1 139.8

The above figures for Great Britain include the Islands unenumerated in the countries.

The true basis, however, is the number of adult stock, as these represent the breeders. In Table II are shown the divisions of Great Britain and the percentages of each class of poultry per 1000 acres of cultivated land.

TABLE II

*Number of Adult Poultry (1908) with Averages per Acre and Acres of Cultivated Land*

Divisions	Fowls		Ducks		Geese		Turkeys	
	Number	Average	Number	Average	Number	Average	Number	Average
Ia Eastern	1,510,000	51.6	500	25.5	15,000	1.1	21,000	8.2
Ib North Eastern	1,075,000	51.2	15,000	26.0	11,000	1.5	21,000	6.4
IIa South Eastern	1,460,000	51.1	1,600	8.1	15,000	5.5	12,000	1.4
IIb East Midland	1,155,000	51.2	650	23.7	15,000	1.5	13,000	1.5
IIIa West-Midland	1,568,000	101.1	12,000	39.1	32,000	10.0	21,000	1.5
IIIb South Western	1,600,000	53.5	110,000	31.5	26,000	5.6	25,000	7.9
IVa Northern	1,575,000	55.1	6,000	19.1	25,000	7.2	11,000	3.4
IVb North Western	2,490,000	106.3	120,000	39.5	51,000	10.5	16,000	4.9
Total England	13,771,000	56.5	741,000	30.1	172,000	7.0	116,000	5.9
Wales	1,210,000	111.5	105,000	56.9	60,000	21.7	26,000	5.9
Scotland	2,120,000	109.1	155,000	35.0	12,000	2.1	27,000	5.5
Great Britain	17,143,000	53.6	1,029,000	31.4	253,000	5	199,000	6.1

The distribution is shown in the tables. These figures do not, however, include any occupations under an acre in extent, and, therefore, all the poultry kept by cottagers and others in rural districts and by private residents in urban and suburban areas are additional. In many manufacturing and mining centres the number of fowls kept by these smaller poultry-keepers is several times greater than on the neighbouring farms. A conservative estimate is that, taking the country as a whole, the number of fowls shown would be increased by at least fifty per cent were such smaller occupations included. The increase in ducks would be very small, and of geese and turkeys practically nil.

The averages given in Table II will show the distribution of the various classes of poultry. So far as fowls are concerned more chickens than adult stock were recorded in 1908 in the North Eastern and South Eastern divisions. In all the others, as in Wales and Scotland, the adults exceeded the young birds, showing that there egg production is the main object. So far as ducks are concerned, young ducks were double the number of old birds, geese about 180 goslings to 100 adults,

and turkeys 250 young birds to 100 adults. Of the last named the highest percentages were in the Eastern, North Eastern and South Eastern divisions of England, where the proportion was 300 to 100.

The tendency for specialisation is more noticeable in the production of high class poultry than where eggs form the chief object. That is true in Britain as throughout Europe. We have the great chicken rearing and fattening industry of south-eastern England, comprising the counties of Sussex, Surrey and Kent; duck breeding as found in Buckinghamshire and parts of the adjacent counties, and turkey breeding carried to its highest point in East Anglia, that is, Norfolk, Suffolk and Cambridgeshire. Formerly in sections of the country, such as Cumberland and Lincolnshire, geese were largely bred. The decline, however, in demand for these birds has been considerable.

These specialised industries are by no means modern, but have increased considerably within recent years, and the tendency is to extend over wider areas. The south-eastern counties have been famous for high class chickens for considerably more than a hundred years, and these still hold the premier position for quality of flesh produced. The great feature of this industry is the benefit derived by farmers and cottagers living in the district over a wide area, as they hatch and rear the chickens, selling them at about three months old to the fatteners, who complete the process by feeding off, then kill, pluck and dispatch to market. Very few farmers attempt to fatten, and fatteners seldom hatch and rear chickens. This division of labour has many advantages, and the prices obtained by rearers are, as a rule, highly profitable to them. During some periods of the year as much as 3s. to 3s. 6d. is obtained for lean, twelve-weeks-old chickens, for which the demand is much greater than the supply.

In the duck districts there is also a dual system, though a different one. There the rearers are mainly small occupiers, some with not more than an acre of land, on which they will raise from 1200 to 2000 ducklings in one season. These men do not, however, as a rule keep the breeding stock, but purchase eggs for hatching from farmers in the country. When the ducklings make their appearance these are forced rapidly forward, and can be grown to a weight of from 4 to 5½ lbs. in less than nine weeks. For good birds placed on the market in March, April, May and June, 9s. to 15s. per couple can be obtained. There are, also, a few large duck plants, one of which has been conducted for several years, and sends out about 40 000 birds per annum. Simplicity is the great feature in duck rearing.

Turkey farming in East Anglia is mainly on large farms, where these birds form only a part, though an important one, of the general operations.

In many sections wide spread attention has been paid during recent years to egg production, of which the Island of Orkney is an example. As a rule, however, the increase has been chiefly due to the large number of fowls kept by farmers, and the greater attention

given to breeding and management. What are called poultry farms, that is, large plants on intensive lines, whilst tried in several cases, as in America, have not been very successful, and are comparatively unimportant factors in the total of native supplies. The policy adopted has kept in view as its first object the development of poultry-keeping as an integral branch of general agriculture. At the same time, however, more intensive methods, more especially on smaller occupations and in suburban and manufacturing areas, are receiving a considerable amount of attention.

In this connection it is realised that increased numbers of poultry kept, whether upon general farms or special plants, involve greater risks of disease and consequent loss to the owners, and also that, with a view to reduction of cost of production, either by improvement of stock or by lessened expenditure for food, or enhancement of returns, there is a great and growing demand for research with respect to the first named, and for experimental work, suitable for application by farmers and others, in so far as the latter are concerned. It is in these directions that Great Britain has been behind some other countries. A few experiments have been carried out, some of considerable value, and a limited amount of research, more especially in connection with breeding, has been conducted. That the field is as yet scarcely touched is generally recognised. The number of problems presenting themselves for investigation is very great, and these will assuredly rapidly increase with growth of the industry. Various proposals are under consideration at the present time, one of which includes the establishment of a National Poultry Institute, which would be a centre for conducting higher experimental work on practical lines, as well as for the treatment of disease. It is also anticipated that poultry will, at an early date, receive their full share of attention at the scientific laboratories of the Board of Agriculture and Fisheries. Hitherto it has been almost entirely a question of money. Thanks, however, to the sums available by means of the Development Fund, the Department of Agriculture will be able to undertake investigations and research, and to make grants to public bodies and institutions capable of undertaking this important and necessary work. Recently such grants have been made to the Agricultural Department of Cambridge University for research in breeding on Mendelian lines, one object of which is an endeavour to produce a race of fowls which shall be non-sitters and yet produce coloured shelled eggs, and to the Cheshire County Council for experiments in respect to table poultry. Further, the Utility Poultry Club has been given a grant in aid of a Twelve Months' Laying Competition on larger lines than attempted before in this country. That, however, is demonstration rather than investigation.

Turning to local Rural Instruction, hitherto, so far as poultry are concerned, the teaching has been mainly by lectures and addresses, supplemented by short classes and demonstrations, and perhaps visits on the part of the lecturer. The tendency now is more to the employment

of practical instructors, who will go to the farms and there demonstrate better methods, showing as opportunity offers how to perform various operations, and give guidance as to the adoption of improved systems. Besides this some County Councils have made grants to rural schoolmasters, who are sufficiently interested, for the establishment of small poultry plants for use in the schools.

In connection with the higher Agricultural Colleges, whilst in a few instances a limited amount of attention has been given to Poultry in the shape of theoretical lectures, up to the present time that is very inadequate. To some extent this may be explained by the fact that larger farmers have not included poultry to any extent among their live stock, save on a non-economic basis, mainly for supply of their own household requirements or to provide «pin-money» for the wives and daughters. A further fact is that as yet there remains a considerable amount of prejudice among farmers with regard to College teaching, and that many of the students are townsmen desirous of entering upon country life either at home or in the colonies. Also, several agricultural teaching centres are associated with universities or university colleges in the great cities, where the conditions are not favourable to the smaller branches of farming. Those institutions which are doing most for poultry have farms for teaching and demonstration, of which the following are leading examples:

Sussex Agricultural College, Uckfield.

Midland Dairy Institute, Kingston.

Lancashire County Council School, Hutton.

West of Scotland Agricultural College, Kilmarnock.

Developments are, however, taking place at other institutions, notably Aberdeen, Bangor, Cirencester, Harper Adams (Newport), and Leeds University, which it is hoped may in due course extend operations in the direction indicated. What is now advocated is that at every Agricultural College systematic instruction in poultry-keeping should enter into the curriculum, and that connected therewith should be a well equipped poultry station for teaching, practice, demonstration and experiment.

One of the special features which characterises the Poultry Industry in Great Britain is the diversity of breeds found throughout the country. These are due, first to the natural variations of climate and soil met with even within a limited area; second, to the great number of smaller breeders, who give play to their own predilections, and have made selection on independent lines; and, third, to the influence of poultry exhibitions referred to below. Even in the fattening districts there is not that uniformity of race which is found in many other lands. Generally, however, during recent years the tendency has been to greater popularity of a few breeds or crosses from these. Among farmers those races which are finding the greater amount of favour may be mentioned: the Italian (Leghorn) fowl, more especially the white variety; the Wyandotte; and the Orpington. The two former

of these are kept specially for egg production, and the latter largely for its table qualities. In ducks the Aylesbury stands easily at the head, as its rapid growth is greatly appreciated, fitting in with our special trade. Of geese the Embden and the Toulouse are about equal in favour, and in turkeys the Bronze American is most widely distributed.

It is unquestionable that exhibitions have exerted a very great influence in awakening interest in the Poultry Industry, more especially in respect to the improvement of breeds. Of these a very great number are held annually, between two and three thousand. Within recent years a great cleavage has arisen between what is known as "fancy" breeders, that is, exhibitors, and such as are concerned mainly with the utility side, by which is meant the meeting of market demands for food supplies. At one time farmers and others looked to the exhibitors to provide them with stock birds. That is no longer the case. Breeding for exhibition has become largely professional. The extremes to which abnormal and non-economic points have been carried, have ruined several breeds in so far as their profitable qualities are concerned. Even our agricultural shows have contributed to the same result. There has, consequently, arisen a large class of specialist breeders who do not exhibit, and who regard the egg or flesh qualities as the main object. The sale of breeding fowls, eggs for hatching, and day-old chicks has grown enormously of late years.

With regard to handling and sale of produce, the conditions in Great Britain differ materially from those met with in some other countries wherein production is much greater than consumption. In Britain the reverse is the case. Our exports of poultry and eggs are nominal, except for breeding stock, whilst our imports (inclusive of Irish supplies) are in value nearly £13 000 000 per annum.

Co-operation in respect to the marketing of eggs and poultry has not advanced so rapidly in England and Wales as in Ireland and Denmark, or more recently in some parts of Scotland. Nearly fifty local societies are engaged in this business, so that the country is as yet very incompletely organised on co-operative lines. Such societies have difficulties to meet with not found elsewhere to the same extent, mainly owing to the fact already mentioned that over large areas of England and Wales the consuming population exceeds greatly the number of possible producers. I know of no county in either country which is able to meet its own requirements in these directions all the year round, as a consequence of which immediate demand is often very great. Outlets are at hand, and prices obtainable from householders or retail traders are high, so that the need for co-operative marketing is not felt, nor is the margin good enough to make such combination profitable. The effect, however, of the work done by the National Poultry Organisation Society during the last fourteen years has been remarkable, equally in the direction of increased production, of improved standards of quality, and better methods of marketing. Traders have

been compelled to adapt their systems to modern conditions, and to pay higher prices to producers, otherwise by co-operative effort they would lose their business. In this way has been secured a great and lasting advance in quality of home produce, more especially in respect to eggs, which at one time, as is still the case in many districts, occupied much too long a time in reaching the consumer, with a consequent heavy loss in value. The society in question has issued a large number of leaflets, and has also published reports on the Poultry Industry in America, Denmark and Sweden, Belgium, and Germany, which have had a wide circulation. In this manner knowledge of what is being done and the methods adopted elsewhere has been disseminated. An estimate has been made that the annual value of the eggs and poultry now produced in the United Kingdom is about £9 000 000 and greater by £6 000 000 sterling than was the case 20 years ago.

### Sheep Breeding in Hungary

by

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Until quite recently, the next most important branch of agriculture in Hungary to cereal growing was sheep breeding. Already in the twelfth century, there were in Upper Hungary flourishing dairy sheep-farms and the mountaineers had also turned their attention to improving the wool of their flocks, even before the Merino breed had spread throughout Europe. The sheep-breeding industry continued to increase, and in the seventeenth century George Szelepcsényi, Cardinal of Esztergom, and the Archduke Eugène interested themselves in the improvement of wool, although, until the eighteenth century, only one indigenous breed was known in Hungary, the Racka breed (*Ovis strepsictrus*) and one hardy breed (*Ovis aries*).

From 1773, when the Spanish Merinos were introduced into Hungary, only small farmers continued breeding Racka sheep, average and large farmers taking to Merinos exclusively. From this time, the Merino spread rapidly, and so great an impetus was given to sheep breeding that even the Hungarian magnates turned their attention to this industry. It was only later, on the abolition of statute labour, when the domains began to turn their pastures into arable land, that the number of sheep decreased. The pastures decreased from 18 487 500 acres in 1869 to 16 354 500 in 1885 and 16 070 000 in 1895. Further, the importation of overseas wool, especially of the Australian product (which was imported into Germany for the first time in 1850 by English merchants, the amount imported into Europe in 1869 being 1 500 tons) caused a great change in our sheep farms.

In the last quarter of the past century, owing to the low price of

wool, breeding sheep for mutton became more general, and large importations of mutton-producing breeds from England were made. These animals were seldom used to produce pure-bred offspring, but were crossed, the crosses often making flocks of excellent quality.

In the interests of the dairy sheep farms, and especially with a view to the improvement of the Hungarian Racka breed, Friesian sheep were imported in 1884; these animals stand the climate of Hungary well and transmit their weight and milking qualities to the cross-breeds.

Finally, from 1890 on, the first Rambouillet sheep were introduced in order to still further increase the weight and improve the wool of the native breed. The Rambouillet sheep were increasingly bred; while later, the early maturing Soissonnais and Chatillonnais Merinos were acclimatized for the same purpose.

The most characteristic representative of the Hungarian breeds is the Racka from the Great Plain (Alföld); this animal still exists in its primitive state on the «Pusztas» of Hortobágy, and is also found in the counties of Árad, Békés and Csongrád. The Racka of the plains is a large animal; height at withers 32 to 34 inches in males, 28 to 30 inches in ewes; length of body 34 to 36 inches in males, 32 to 34 inches in ewes. The height at the withers is thus remarkably large in comparison with the body-length. The live-weight of rams is 130 to 135 lbs., of ewes 100 to 110 lbs. The horns of both rams and ewes are long; they bend somewhat forwards and are twisted. At the conjunction of the face and skull, between the frontal bone and the nose, occurs a characteristic depression. The woolly tail reaches the hocks.

The wool, which is 8 to 12 inches long, is composed of thick staple and down; it is used in the manufacture of thick cloths and blankets; in making felt it is necessary to mix it with finer wools. This breed has to a large extent been superseded on the great Alföld by Merinos; but where the liver-fluke decimates Merino flocks, the Racka sheep flourish, as they are not so susceptible to the attacks of this parasite, and avoid damp places. Besides the Racka of the plains, there is also the mountain race; this is commonest in Transylvania and Upper Hungary; its characteristics have, however, been modified by numerous crosses. It is a weakly, small animal, except in the mountain districts of the counties of Krasso-Szörény and Torontál. In Transylvania also, in certain districts where it bears traces of crossing with Lincolns, this sheep attains a larger size.

The sheep are put to the tup at a year and a half. Lambing takes place usually in February, and the lambs are either sold soon, or else kept till the middle of May, when the sheep are first milked; milking generally continues till the end of September. The variations in the number of sheep in Hungary have been as follows.

1851	.....	10 600 000
1860	.....	15 000 000
1895	.....	7 500 000
1905	.....	6 700 000
1911	.....	7 700 000

As is seen, the number was least in 1905, after which it once more increased. The number of sheep per 1 000 inhabitants was 1051 in 1870, 726 in 1880, and 418 in 1911.

The decrease in sheep is recorded especially in the districts where Merinos were preponderant, *i.e.* in the Great Plain (Alföld), and on the right bank of the Danube.

In 1880 the total still included 67 per cent. of Merinos; in 1911 this percentage sank to 29, and while the Merinos decreased by 38 per cent., the number of sheep kept for milk and mutton rose from 3.2 to 4 millions; this shows that breeders consider milking ewes, and secondarily mutton sheep, as more paying than Merinos, whose chief value lies in their wool.

These figures are further explained by the fact that the breeding of milch sheep is chiefly in the hands of small owners in mountain districts, where even now, sheep find abundant pasturage, while Merino breeding was continued on the large estates in the plain (Alföld) and in the districts on the right bank of the Danube, where owing to the rapid increase of intensive cultivation, the animals were gradually deprived of their pastures.

In Hungary, Racka or Merino flocks graze in the open almost throughout the year, except during the coldest winter months; and even then, if there is not much snow, they pass several hours daily at grass. Sheep breeding is thus based in the first instance on pasturage, partly on pastures unsuitable for other animals, and partly on the temporary pastures of farms where intensive cultivation is practised.

Wool and lambs are the chief sources of revenue of the Merino sheep farms. Shearing is done once a year, in June, the sheep being sometimes washed previously. On farms which devote their attention to lambs, lambing is very early, in December or January, so as to profit by the very high prices made by early lambs. The practice is, however, costly because better feeding is necessary. Sheep farms which depend on the sale of breeding animals, or the fattening of wethers, fix the lambing time for the end of February or beginning of March. The large sheep farms are occupied also with the sale of breeding animals, either by notice of sale, or at auctions, but especially at a Show organized every spring at Budapest by the National Hungarian Farmers' Association. From 1000 to 1500 breeding sheep are sold, of which the price varies as follows:

	♂	♀	♂	♀	♂
Negrette-Electoral: ram . . . . .	5	0	0	10	20 16 8
"    "    ewe . . . . .	2	10	0	"	4 3 1
Combed Hungarian: ram . . . . .	4	3	4	"	8 6 8
"    "    ewe . . . . .	1	13	4	"	1 3 1
Rambouillet: ram . . . . .	4	1	4	"	16 13 4
"    "    ewe . . . . .	4	3	4	"	8 6 8
Early Merino: ram . . . . .	4	3	4	"	33 6 8
"    "    ewe . . . . .	3	6	8	"	4 3 4
English mutton breeds: ram . . . . .	7	10	0	"	8 6 8
Racka: ram . . . . .	1	15	4	"	1 3 4
Friesian: ram . . . . .	4	1	1	"	8 6 8

As a rule the only food given in winter is straw with a little hay; only on first class farms a little grain is given. The wethers are generally put up to fatten at 18 months; besides straw, hay and beet pulp, they get  $1\frac{3}{4}$  to  $2\frac{1}{4}$  lbs. of maize meal per head.

According to the census taken on February 28, 1911, the total number of sheep in Hungary, without lambs, amounted to 6 677 680 head. Fixing the net return at 2s 1d per head, the total returns from sheep come to about £700 000. The net return, of the Merinos especially, could not be put higher than 2s 1d per head, and is in fact often less. The following figures give the receipts and expenses of a flock of 4200 fine-woolled sheep in 1910:

*Receipts.*

	£	s	d
1) Sale of 34 270 lbs. of wool at about 8d per lb. . . . .	1153	5	10
2) Sale of sheep:			
30 culled rams at 26s 8d = £ 40			
241 culled ewes at 13s 4d = » 166			
310 fat wethers at 25s = » 387 10s			
	587	10	0
3) Mutton sold to servants and labourers. . . . .	60	8	4
4) Sale of skins . . . . .	48	15	0
5) 3000 tons of dung at about 1s 2d per ton. . . . .	625	0	0
Total . . . . .	£. 2474	19	2

*Expenses.*

	£	s	d
1) 5% interest on capital expended on 4200 animals calculated at 12s 5d per head: £2625 . . . . .	131	5	0
2) Rent of stable calculated at 5% of a building worth £1875 . . . . .	93	15	0
3) Salaries of persons employed . . . . .	187	10	0
4) Salt and other expenses. . . . .	46	13	0
5) Shearing. . . . .	37	10	0
6) Rent of 725 acres of pasture at about 5s 10d . . . . .	212	15	0
7) 512 cwt. of maize at 4s 9d . . . . .	121	6	8
8) 276 cwt. of oats at 6s 10d . . . . .	93	6	8
9) 133 cwt. of tail wheat at 2s 1d. . . . .	45	16	8
10) 74 tons of mangokis at 8s 6d . . . . .	31	5	0
11) 245 tons of hay at 42s 4d . . . . .	520	16	8
12) 25 tons of lucerne at 50s. . . . .	62	10	0
13) 344 tons of spring-grain straw at 17s . . . . .	291	13	4
14) 393 tons of winter-grain straw at 10s 2d . . . . .	200	0	0
Total . . . . .	£ 2078	5	0

The net return is thus £396 14s 2d, or 1s 10 $\frac{3}{4}$ d per head. But taking into consideration that the cost of upkeep of dairy-sheep farms has decreased of late years, while the price of cheese has risen considerably, the return of these sheep-farms can be put at a slightly higher figure: 2s 11d per head.

The following is a description of the internal administration of some large sheep-farms.

1. *Rambouillet Flock of the Estate (in trust) belonging to Marquis Alex. Pallavicini at Mindszentágyó.* — The sheep lamb in January, 90 per cent. being fertile; the percentage of twins is from 8 to 10, so that the increase is nearly 100 per cent. The lambs are weaned at four months and until this time they are given about 10½ oz. of oats, and lucerne hay *ad lib*. From the beginning of May to November, the whole flock is on pasture. During winter, the lambs get 1½ lb. and the ewes 2¼ lb. of hay, and they are allowed as much straw (from spring and winter grain) as they will eat. The ram runs with the ewes in August, when the latter are 20 months old. The live-weight of the old rams is 176 to 255 lbs., that of wethers 132 to 154 lbs., and that of ewes 110 to 143 lbs. The wool is shorn unwashed; the average fleece of old rams is 16 lbs., while wethers give 11 lbs. and ewes 9 to 11 lbs. The general average is 9 to 13 lbs., yielding 35 per cent. wool. The value of the wool is about 8¼d per lb. The surplus stock is partly sold for breeding purposes and partly as culls; 50 or 60 stud rams are sold annually at 6 to 13 guineas. The culls are sold at the current price immediately after shearing, when they have grazed for six weeks.

2. *Emilie Skublic's Rambouillet Sheep-farm at Zalaszentmiklós.* — Lambing: 80 per cent. of the ewes lamb (twins 7 per cent.); takes place in January. The lambs are weaned at three months. Whilst being suckled, the lambs eat first quality hay *ad lib.*, as well as a mash of oats and maize. The flock grazes during summer; in winter they get clover and "three months' hay" (1) as well as straw. Live weight: ram 224 lbs., wether 128 lbs., ewe 117 lbs. The ewes are served in August, when towards two years old. The wool is shorn unwashed, the ram's fleece runs to 22½ lbs., the ewe's 13¾ lbs. The wool is sold in Budapest at 6¾d to 7¼d per lb. Every year 50 or 60 yearling rams are sold at the average price of 6 guineas, and culls fetch 16s 8d.

3. *Negrette Electoral Sheep-farm of Count Louis Károlyi at Tótmegyer.* — In the pedigree flock, the ewes lamb twice a year, in January and in July; in the other flocks only once, in January. The percentage of ewes lambing is 70 to 85; twins 2 to 4 per cent. The lambs are weaned at 20 to 24 weeks; up to weaning the pedigree lambs get abundance of oats and lucerne hay. The daily ration of the other lambs is 8 to 10 oz. of oats and 1 lb. of lucerne hay. The young ewes are put to the tup in the middle of July when 2½ years old. In summer they run on grass; the winter ration consists of 1 to 1¾ lbs. of hay, ¾ to 1 lb. of spring-grain straw, 1 to 4½ lbs. of beet tops and leaves, and 2¼ lbs. of beet pulp. The fleece of the rams, shorn unwashed, averages 17½ lbs.; the other sheep are washed and the fleece weighs on an average 2½ lbs. The first is sold at 7½d to 9d per lb., the second at 2s 8d

(1) A mixture of vetches and wheat, oats, etc.

(Ed.).

to 3s. The live-weight of the rams is 145 lbs., that of the ewes 88 lbs., and that of the wethers 110 lbs. Store wethers fetched 29s the pair in 1908. The wethers are sometimes fattened, when they are given daily 10 oz. of crushed maize, 10 oz. of beans,  $2\frac{1}{4}$  lbs. of hay,  $3\frac{1}{4}$  lbs. of beet pulp and a little spring-grain straw. Sometimes they get  $1\frac{3}{4}$  to  $2\frac{1}{2}$  lbs. of whole maize,  $2\frac{1}{4}$  lbs. of hay, and  $3\frac{1}{2}$  lbs. of beet pulp. Every year 30 to 40 rams are sold at prices ranging from £ 5 to £ 25.

4. *Negrette Electoral Sheep-farm of Count Ladislaus Károlyi at Derekegyház.* — The ewes lamb once a year, in January. The average of ewes lambing is 85 per cent., twins 4 per cent. The lambs are weaned at 10 months, and while being suckled, are given oats and ground maize *ad lib.* After weaning, this food is given to the lambs until they are a year old. The same food is given to the rams during the tupping season and to the ewes while suckling their lambs. The ewes are put to the ram in August, when  $2\frac{1}{2}$  years old. The unwashed wool fetches 9d to  $9\frac{1}{2}$ d per lb. in Budapest. The average fleece weight is  $8\frac{3}{4}$  lbs. Culled ewes are sold at 15s to 16s 8d, old rams at 25s to 27s 6d, and wethers at 20s to 25s the pair. The average live weight of full-grown sheep is 70 lbs. Wethers to be fattened are put onto good alkaline pasture and get  $\frac{1}{2}$  to  $\frac{3}{4}$  lb. of concentrated food. Rams are sold at prices ranging from £ 6 5s to £ 12 10s, ewes at £ 2 1s 8d to £ 4 3s 4d.

We will now give some details as to the production of wool and the wool-trade in Hungary.

The conditions already mentioned led especially to a perceptible decrease in the production of fine wool for cloth manufacture; this type is produced less and less in Europe, and, as it is also necessary for making felts, the demand for the Hungarian produce is steadily increasing, and foreign manufacturers give very high prices for it. The combed Hungarian wools are also in great demand, as their quality is considerably superior to that of average overseas wools, for it is stronger and free from thistles, and therefore much sought after for making very strong yarn.

The following are some details on the chief qualities of Hungarian wool. The average yield, calculated at 10 per cent. of moisture, is shown by the following figures, which are based on the examination of numerous samples over twelve years:

Quality	Yield per cent.
<b>Unwashed wool:</b>	
Merino, for cloth . . . . .	22.4
Merino, for textile fabrics . . . . .	28.4
combed Merino, for cloths . . . . .	31.9
Cigája and Racka . . . . .	51.8
lambs' . . . . .	31.7
<b>Wool from washed sheep:</b>	
Merino, for cloth . . . . .	71.8
Merino, for textile fabrics . . . . .	64.6
combed Merino . . . . .	62.6
Cigája and Racka . . . . .	70.6
lambs' . . . . .	67.7

## Lowest and highest price per pound

	1908			1909			1910			1911			1912							
	s	d	s	d	s	d	s	d	s	d	s	d	s	d						
From washed sheep.																				
Merino, for cloth, superfine . . .	2	1 $\frac{1}{4}$	2	3 $\frac{1}{4}$	—	2	4 $\frac{1}{4}$	2	2 $\frac{1}{4}$	2	5	2	1	2	5 $\frac{1}{2}$					
» » » fine . . .	1	10 $\frac{1}{4}$	1	11 $\frac{1}{4}$	1	10 $\frac{1}{4}$	2	2 $\frac{1}{4}$	1	11 $\frac{1}{4}$	2	1	1	8 $\frac{1}{2}$	2	2	1	8 $\frac{1}{2}$	1	10 $\frac{1}{4}$
For weaving, fine . . .	1	6 $\frac{1}{4}$	1	10 $\frac{1}{4}$	1	4 $\frac{1}{4}$	1	8	4 $\frac{1}{2}$	1	7 $\frac{1}{2}$	1	6 $\frac{1}{4}$	1	8 $\frac{1}{2}$	1	4	1	7 $\frac{1}{2}$	
» » (demi-fine) . . .	1	3	1	5 $\frac{1}{2}$	1	4	1	6 $\frac{1}{4}$	1	3 $\frac{1}{2}$	1	7	1	4	1	6 $\frac{1}{4}$	1	3 $\frac{1}{2}$	1	5
» » coarse . . .	1	0 $\frac{1}{2}$	1	3	1	2 $\frac{1}{2}$	1	4	1	1 $\frac{1}{4}$	1	3 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1	4	1	1	1	3 $\frac{1}{2}$
Combed, washed . . .	1	0 $\frac{1}{4}$	1	3 $\frac{1}{4}$	1	3 $\frac{1}{4}$	1	5 $\frac{1}{4}$	1	4	1	5	1	3 $\frac{1}{2}$	1	5	1	3 $\frac{1}{2}$	1	1 $\frac{1}{2}$
» demi-fine, A-B . . .	1	1	1	2	1	1 $\frac{1}{4}$	1	4	1	1	1	4	1	1 $\frac{1}{2}$	1	3 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1	3 $\frac{1}{2}$
» cross-bred, B-C, containing sand and burs . . .	8 $\frac{1}{4}$	10 $\frac{1}{2}$	9	1	1 $\frac{1}{2}$	1	0 $\frac{1}{4}$	1	2 $\frac{1}{2}$	1	1	1	1	1 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1	10 $\frac{1}{2}$	1	1 $\frac{1}{2}$
Cigaja, C-D . . .	6 $\frac{1}{4}$	8	9	10 $\frac{1}{2}$	9 $\frac{1}{2}$	11	8 $\frac{1}{4}$	10 $\frac{1}{4}$	8 $\frac{1}{4}$	10	8 $\frac{1}{4}$	10	8 $\frac{1}{4}$	10						
Racka, E-EE . . .	6 $\frac{1}{2}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$	10 $\frac{1}{2}$	7 $\frac{1}{4}$	10	7 $\frac{1}{4}$	9 $\frac{1}{4}$	8 $\frac{1}{4}$	10										
Lambs', superfine . . .	2	2	2	9 $\frac{1}{2}$	2	3 $\frac{1}{4}$	2	10	2	5	3	0	2	6	3	0	2	8	3	0
» demi-fine . . .	1	1 $\frac{1}{2}$	1	8 $\frac{1}{4}$	1	3	1	10 $\frac{1}{4}$	1	10 $\frac{1}{2}$	1	5 $\frac{1}{4}$	1	3 $\frac{1}{2}$	1	4 $\frac{1}{2}$	1	3 $\frac{1}{2}$	1	5 $\frac{1}{4}$
» middling and coarse . . .	9	10 $\frac{1}{2}$	9	1	0 $\frac{1}{4}$	10 $\frac{1}{2}$	1	1 $\frac{1}{2}$	9 $\frac{1}{4}$	1	1 $\frac{1}{2}$	9 $\frac{1}{4}$	1	1 $\frac{1}{2}$	9	1	0 $\frac{1}{4}$			
Shorn twice, from mountains, white and demi-fine, A-B . . .	11 $\frac{1}{4}$	1	0 $\frac{1}{4}$	1	0 $\frac{1}{4}$	1	2	1	2	1	2 $\frac{1}{2}$	1	2	1	2 $\frac{1}{2}$	1	1 $\frac{1}{4}$	1	1 $\frac{1}{2}$	
Shorn twice, from mountains, middling and coarse, B-C . . .	11	11 $\frac{1}{4}$	10 $\frac{1}{2}$	11 $\frac{1}{4}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	9	10 $\frac{1}{4}$	8 $\frac{1}{4}$	10										
Unwashed:																				
Merino, for cloth, superfine . . .	6	7 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$	6 $\frac{1}{4}$	8 $\frac{1}{2}$	7 $\frac{1}{4}$	9 $\frac{1}{4}$	7 $\frac{1}{4}$	9 $\frac{1}{2}$										
» » » fine . . .	5 $\frac{1}{2}$	6 $\frac{1}{2}$	5 $\frac{1}{4}$	7 $\frac{1}{4}$	6	6 $\frac{1}{4}$	6 $\frac{1}{2}$	7 $\frac{1}{4}$	6	7										
For weaving, fine . . .	5 $\frac{1}{2}$	6	6 $\frac{1}{4}$	7 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	6 $\frac{1}{4}$	7 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$										
» » (demi-fine) . . .	5	6	6 $\frac{1}{4}$	6 $\frac{1}{4}$	6 $\frac{1}{2}$	6 $\frac{1}{4}$	6 $\frac{1}{2}$	6 $\frac{1}{4}$	6 $\frac{1}{2}$	6 $\frac{1}{4}$										
» » coarse, B-C . . .	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6	6 $\frac{1}{2}$	6	6 $\frac{1}{2}$	6	6 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$										
Combed, fine, AA-A . . .	6 $\frac{1}{2}$	7 $\frac{1}{4}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	7 $\frac{1}{4}$	8 $\frac{1}{2}$	7 $\frac{1}{4}$	8	6 $\frac{1}{2}$	7 $\frac{1}{4}$										
» demi-fine, A-B . . .	5 $\frac{1}{2}$	6 $\frac{1}{2}$	6	6 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	6	7	5 $\frac{1}{2}$	6 $\frac{1}{2}$										
» cross-bred, B-C, containing sand and burs . . .	4	5 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	5	6 $\frac{1}{4}$	5 $\frac{1}{2}$	6	4 $\frac{1}{4}$	5 $\frac{1}{2}$										
Cigaja, C-D . . .	4 $\frac{1}{2}$	6 $\frac{1}{2}$	5	6 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	6	7 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$										
Racka, E-EE . . .	4	5	4	6	5	5 $\frac{1}{2}$	4	5 $\frac{1}{2}$	3 $\frac{1}{2}$	4 $\frac{1}{2}$										
Lambs', superfine . . .	6 $\frac{1}{4}$	9	7 $\frac{1}{4}$	9 $\frac{1}{4}$	6 $\frac{1}{4}$	9	6 $\frac{1}{2}$	9 $\frac{1}{4}$	7 $\frac{1}{4}$	9 $\frac{1}{4}$										
» demi-fine . . .	5 $\frac{1}{2}$	7 $\frac{1}{2}$	5 $\frac{1}{4}$	7 $\frac{1}{2}$	5 $\frac{1}{2}$	7 $\frac{1}{2}$	5 $\frac{1}{2}$	7 $\frac{1}{4}$	6	7										
» middling and coarse . . .	4 $\frac{1}{2}$	5 $\frac{1}{2}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	4 $\frac{1}{2}$	6	4	5 $\frac{1}{2}$	4	5										

That these data may be properly understood, it should be remarked that they include figures from both small and large farms, while those from large estates usually far exceed the figures given. Taking this into consideration, it may be shown that, not only is the yield of Hungarian wool large, but that the product possesses extraordinary strength, and therefore, as just said, is much prized and fetches a high price.

In Hungary, since 1894 (Budapest) wool has been sold by public auction twice a year, in July and October. The amount of wool sold last year at the July auction was 11 669 bales, while at the autumn auction 11 011 bales were sold. Besides the Budapest public auctions, there are public wool fairs held at Losonez and Miskolez. At the auctions superfine wools for cloths are the most sought after, and are considered more and more as being a Hungarian speciality.

The accompanying table gives the fluctuations in the Hungarian wool market during the last five years.

As for the wool trade, the importations tend to increase and the exportations to decrease, as is shown by the following tables :

*Imports*

1906	6 361 650 lbs.	worth	£209 728 10s 0d
1909	7 960 900 "	"	£425 151 16s 10d
1910	8 844 900 "	"	£445 581 9s 2d

The largest amount of imported wool comes from Rumania, which country in 1911 furnished 2 618 000 lbs. Almost the same quantity came from Austria and Germany together, while the total import from Belgium, France, England and Russia amounted to 2 million pounds.

*Exports.*

1906	20 664 800 lbs.	worth	£1 049 617 0s 0d
1909	16 907 700 "	"	£ 806 713 4s 2d
1910	16 669 000 "	"	£ 818 315 1s 10d

The largest exportation is to Austria : 11 286 300 lbs. ; next comes Germany with 3 119 300 lbs., while still less is sent to Servia and Russia.

Hungary has also a considerable import trade in woollen stuffs. In 1910, 33 142 750 lbs., worth £6 097 008 were imported ; of this amount about 11 million pounds came from England and Germany, and the remainder from Austria. On the other hand, in 1910 Hungary exported 4 782 000 lbs. of woollen stuffs, worth £621 154, of which only 233 250 lbs. were sent to Bosnia and Herzegovina, the rest going to Austria. In comparing the trade statistics of 1905 with those of 1910, it can be stated that in Hungary, the woollen stuffs trade is on the increase. But, while our exports had scarcely doubled during this period, the imports, which in 1905 were not over 14 032 600 lbs., worth £3 106 853, had already more than doubled in 1910.

Cheese from ewes' milk is a considerable item in the trade of Hungary. The following figures give the exports and imports for 1910:

Imports	3 852 900	lbs.,	worth	£161 338 13s 4d
Exports	8 307 700	"	"	£112 520 15s 0d

While the imports have rarely exceeded the above sum, the exports show a slight, but continuous, increase. The chief export was cheese made from the milk of "Liptó" sheep, which is a cross between the Racka breed of Upper Hungary and that of the mountainous districts of Transylvania. This cheese is soft and has a pleasant flavour; large quantities are exported, even to England. The perceptible increase in Liptó sheep cheese is shown by the following figures, which refer to three years:

1901	3 491 000	lbs.,	worth	£ 60 700 10s 8d
1905	4 577 000	"	"	£ 82 178 10s 2d
1910	5 647 800	"	"	£108 876 10s 0d

Hungary's foreign sheep and mutton trade is considerable. In 1910 she exported 135 725 head, worth £162 223, chiefly to Austria, but also to Germany and Switzerland, while the imports were only 173 live sheep worth £125 12s 6d.

In 1910, 2 357 400 lbs. of mutton, worth £53 465, were exported to Austria. This does not include lambs of live weight below 31 lbs.; in 1910 12 832 of these, worth £5 598 10s, were exported, and 2 135, worth £923 10s, were imported. While the export of mutton hardly varies, there is a perceptible decrease in the number of live sheep exported. Thus, in 1901 the number of the latter was 205 340 head, worth £136 270, while in 1905 it had fallen again to 150 463, worth £133 793.

The trade in skins of sheep and lambs in Hungary is also considerable. In 1910, 2 421 500 lbs. of sheepskins, worth £45 767, were exported, while 1 715 600 lbs., worth £42 805, were imported. In the same year 1 710 000 lbs. of lambskins, worth £72 722, were exported, and 712 750 lbs., worth £36 670, imported.

These data serve to show that, while the stock of sheep tends to decrease in Hungary, as indeed is the case in the other countries of Europe, it is at the present time very considerable and is the source of a large revenue. On the other hand, given that: 1) the agricultural development of the mountainous districts cannot keep pace with that of the great plains; 2) the fields of these districts, which are difficult to cultivate, form abundant pastures; 3) dairy-sheep farming is lucrative, it may be supposed that the decrease in the number of sheep in Hungary will not continue, and that even a fresh impetus in favour of sheep breeding is not impossible.

## The Use of Agricultural Implements in Japan

by

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The traveller in the country districts of Japan is struck with the smallness of the fields, the steepness of the terraced hills and the absence of pastures as well as of animals working on the farms. Closer investigation will show that rice being the most profitable crop, wherever it is possible to do so the fields are so laid out that they can be flooded with water. Inquiry as to the size of the holdings will show that they are small and that they are in a large proportion cultivated by tenant farmers.

These conditions indicate that agricultural implements, such as those used in Europe and America, are rarely met with. The system of culture is intensive and good crops are obtained, so, as one would expect, the implements in use are well adapted to local conditions.

Of these tools the hoe, or *kuwa* rather, is by far the most important. It is used in a variety of ways, and with a skill surprising to one accustomed only to the simple uses of the hoe in occidental hands. It is used for digging up the soil, thus taking the place of the spade, which is little used. With the *kuwa* also the soil is pulverized and levelled, the tool thus accomplishing on a small scale the work of the plough, the harrow and the roller.

As to the construction of this most useful tool, it resembles the German "Handhack", but differs from this in the smaller angle that the blade makes with the handle, and the greater length of the blade. The angle is often as small as 30 degrees, and occasionally as great as 85 degrees. The blade is from 4 to 8 inches broad and 10 to 20 inches long; while the handle varies in length from 2 to 6 feet. Where the blade is of the greater lengths, it is made of wood with an iron cutting edge and thus both the weight and the cost are reduced. It is said that there are as many as a thousand different kinds which have been worked out to meet the demands of the various conditions of the soil and the different purposes of use. When wet or heavy soil is to be worked, the blade of the *kuwa* is divided into two, three or four prongs, as the European spade changes to a forked spade.

Next in importance to the hoe, as an agricultural implement, comes the plough or *suki*. There are two types of the plough: one resembles the single shovel plough of America, and the other the Meklenburger Haken. The share and mouldboard are made of cast iron and the other parts always of wood. The mouldboard, being plane or slightly curved, acts principally to pulverise and mix the soil. The turning action is not as great as in the plough of European type.

The striking feature is that one never sees a pair of horses or a yoke of oxen attached to a plough, the animal used being always alone.

This kind of plough is specially adapted for the cultivation of the more or less wet soil of the rice fields, in which ploughs of occidental type would be of no avail. This primitive form of plough is also well adapted for throwing the soil into ridges after the rice crop has been harvested, so that the earth may dry sufficiently for the growth of the secondary crop which is obtained from the land before the time for transplanting the rice.

After the rice field has been ploughed, it is flooded and the soil is thus easily mixed and broken up with the aid of the so-called "horse-hoe" or *ma-kawa*, which is, in fact, a kind of one-rowed harrow.

In doing this work by hand, a kind of rake is used for the purpose of mixing; while the forked hoe may take the place of the plough in breaking up the field.

In cultivating the crops, such implements as the horse hoe and the "Hackpflüge" of Germany are not used, being replaced by a light form of the ubiquitous *kawa*. A tool like the weeding hoe of the Occident is also in use.

In weeding rice fields, an implement somewhat like the Norwegian harrow is used. Teeth are set either in straight or curved lines in a wooden revolving cylinder and the implement is drawn by hand. In addition to the above-mentioned implement, there are various other tools used in weeding.

In seeding, the work was done by hand only, until recent years, and great skill was attained. Nowadays simple drills and seed droppers, invented in the country, are sometimes used. They are small implements and are worked by hand. Wheat and barley are sown in drills, but rice is thickly sown in small seed-beds from which the young plants are transplanted.

For harvesting grain, the sickle, or *kama*, is used altogether. This instrument is, in effect a diminutive scythe with a straight or slightly curved blade and a straight handle set at a right angle or an obtuse angle to the blade. The handle is from 8 to 16 inches in length; but for cutting tall grass, a sickle with a longer handle is sometimes used.

Scythes are coming into use in some parts of the country; but mowers and reapers are seen only on a few large farms devoted to raising of cattle, and they are mostly of American make.

For harvesting roots, the *kawa* again is used, no such implements as the potato digger and "Rübenheber" being met with.

When the sheaves of grain are ready for threshing, various simple devices are used. Ordinarily, the heads of grain are pulled from a double handful of stalks by whipping these into a kind of comb and pulling the heads off between the teeth. The comb is fixed to an immovable bench, which is about half the height of a man, and is set at such an angle as to meet the descending stalks at about a right angle. The teeth are about twenty in number and are of sizes suited to the grain to be threshed.

The hulls are next removed by grinding the grain between two light cylinders arranged like the upper and the nether mill-stone.

The grain is separated by a kind of winnowing machine, called *tomi*, which differs but little from the "Getreide centrifuge" with its arrangement of sloping vibrating sieves. For small quantities of grain, the separation is effected in the primitive way by taking advantage of a suitable wind.

Considering the condition of the agricultural industry we are led to make the following suggestions :

1. For cultivation, the use of farm animals should be increased.
2. The advance in the co-operative system for threshing should make it possible to use animals and mechanical powers in this work.
3. The use of ploughs and harrows constructed to suit the needs should be encouraged. The 'Hackpflüge' or vineyard plough would seem to be nearly adapted to the needs in dry fields.
4. In the case of wet fields, special implements must be invented, since necessity has not called for the invention of such devices in other lands.
5. The drills and dropping machines now in use should be improved.
6. For harvesting there seems to be no possibility of using Western machinery, and the sickle should be so modified as to be made more effective.
7. In the preparation of grain, however, it is most desirable that Western threshing machines should be brought into use.
8. There is no special demand for agricultural implements used in connection with cattle raising.

Such, in brief, is the present condition of the agricultural part of the country with regard to the use of implements. But some change will be necessary owing to the concentration of labour in the rising industrial centres and the increased demand for agricultural products together with the decreased supply of hands. This new condition seems to demand an increased use of machinery together with an increase in the use of farm animals or some mechanical motive power.

The straightening out of the old irregular boundaries between the fields and the re-allotment of the land which is now in progress throughout the country will pave the way for the use of machinery drawn by animals or other motive power.

The kind of implements to be used must be determined by careful study of local conditions, and the Government has already instituted a special section in the State Experimental Station for the investigation of this matter.

Many of the implements of the Occident are adapted for use on large farms only, and none have yet been invented suited for use in the wet ground of the rice fields. We must look for adaptation of imported implements, and improvement of existing domestic types, to bring into being the devices called for by the new conditions in New Japan.

Some thirty five years ago, the Government established a farm implement factory, but at that time the need of new implements was not felt and the enterprise, which was in advance of the times, ended in failure. Nowadays private enterprise is, on the one hand, bringing in imported implements such as experience shows to be in demand; and, on the other hand, is manufacturing such improved types of domestic implements as have been evolved in the new conditions of the country.

## The Development of the Dried Yeast Industry in Germany

by

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During the last three years a new industry has begun to develop, the products of which are important as food for men and animals, namely yeast drying. Though this industry is still only in its initial stage, it can safely be predicted that it will soon attain an important position in the economy of the country. The interest which German farming circles have shown for the chief product of the yeast-drying industry, namely «feeding yeast» (Futterhefe), is very lively and has led to an increase and improvement in the economic relations between agriculture and the brewing industry which provides the raw material for the yeast drying works.

The drying of yeast owes its origin to the necessity felt by brewers of utilizing in a profitable manner the yeast which is produced in excess during brewing. In order to understand fully the state of the question, a few words on the excess of yeast in the breweries and on its utilization will not be out of place.

In the compressed yeast industry which prepares bakers' yeast, the production of yeast is the object aimed at; consequently here an excess of yeast is practically non occurrent. Just that quantity of yeast is produced which the market will take up. It is quite different in brewing, in which yeast is only a means for the production of beer, and the increase of yeast which occurs during the process of fermentation is only a by-product. A portion of this yeast is used in the brewery itself for the new wort; the greater part however remains free to be utilized in other ways. *The quantity of this excess of yeast in Germany alone may be calculated at 68 600 tons per annum.*

The utilization of brewers' yeast has been studied with the greatest interest during the last few decades. The need for a solution of this problem is intimately connected with the development of the two industries: brewing and the making of compressed yeast. When the latter industry did not yet exist, all the yeast required by bakers and by

households was supplied by brewers' yeast, which was chiefly the product of high fermentation beer. With the flourishing of the compressed yeast industry, the products of which were superior, for baking purposes, to brewers' yeast, and with the prevalence of low fermentation beers over those prepared by high fermentation, together with the disappearance of many small breweries and the transformation of the brewing industry into one of large concerns, the sale of brewers' yeast for bakers diminished constantly. At present it may be assumed that of the 68 600 tons of brewers' yeast at most 9800 tons are used by bakers.

Naturally the brewing industry endeavoured to reconquer the lost market: the bakeries; only all attempts made in this direction have failed, as it has not been possible by any treatment to make the brewers' yeast equal to the compressed yeast. Other efforts were made to prepare extracts of yeast to be used instead of meat extracts for the seasoning of food. Although this manufacture succeeded from a technical point of view, it was not possible to find a sufficient sale for the manufactured article; it seems that it is only in England that considerable quantities of brewers' yeast are admitted into the food industry.

Parallel with these efforts one form of utilization was going on and led to good results: *The feeding of fresh yeast to cattle and to pigs.* An especial stimulus to this use of yeast was given by its high protein content, which averages in the dry matter about 55 per cent., and allows it to rank among the best concentrated foods. However, this form of utilization could attain only local importance, as fresh yeast, even after pressing, is easily spoilt and does not stand carriage, especially in summer, to any great distance. So that yeast was only useful to those farmers who lived near a brewery and could get the yeast fresh. It was generally carted off together with the brewers' grains, with which it was fed after being boiled.

*The chief object of yeast drying is the full utilization of the excellent feeding properties of yeast and the rendering of them available to all farmers.* Only by proper drying can yeast be made to keep good and become a marketable commodity. It is the merit of the Institute for Experiments and Instruction in Brewing of Berlin that this point of view has been recognized and generally adopted as the basis for the full utilization of yeast. When the Institute began its work on yeast drying in 1910, it appeared that in some places yeast driers were already at work (the apparatus of Max Oschatz of Dresden at the Schultheiss brewery, 2nd division, Berlin, and the apparatus of Emil Passburg of Berlin at the Marmite Food Extract Company in London). The Institute organized a prize competition for yeast-drying apparatus, and thus furthered the development of the yeast-drying industry. The results of the competition showed that the German machine industry is capable of meeting the demands made upon it by any industry. All the yeast driers tested at the competition were cylinder apparatus, as they are much used in the industries and especially for potato driers (turning out potato flakes) of which a great number have been set up in Germany. German agri-

culture may note with satisfaction that the potato-drying industry has been the model which yeast drying has followed. Of the existing yeast-drying systems the greater number of apparatus are built by those firms which have already made a name by their potato driers for producing potato flakes. Also the build of yeast driers is in the main based on the experience gained in the construction of potato driers. The principle upon which all these apparatus are designed is essentially the same. The moist yeast passes over steam-heated cylinders, dries in fractions of a minute on them and is continuously scraped off the revolving cylinders by stationary blades.

The section of alimentary physiology of the Institute of Fermentation Industries in Berlin, to which the Institute of Experiment and Instruction in Brewing is attached, has also supplied the scientific and practical foundations for the practice of feeding dry yeast. Formerly very little was known on this subject. Now, thanks to the researches of Völtz and his collaborators Paechtner and Baldrexel, carried out in the above section, it is known *that dry yeast is one of the richest concentrated foods, that it is relished and well assimilated by all kinds of live stock, and that it is especially suitable for fattening purposes.* The writer was the first to draw attention to the fact that dry yeast is not one of those foods the price of which corresponds to its calculated food value (like potatoes, maize, barley) but belongs to those whose price, owing to special dietetic properties, lies considerably higher than their calculated food value would warrant (oats, fish-meal, flesh-meal).

The above researches furnished the following data :

*Sheep* (1) utilize 94 per cent. of the organic matter, 88 per cent. of the crude protein and upwards of 100 per cent. of the nitrogen-free extract (2) of the dried yeast, which has a higher nutritive value than cottonseed meal.

For *horses* (3) more than half of their grain ration may be replaced by a corresponding quantity of nutritive substance in the form of dried yeast and dried potatoes without prejudice to their health, appearance or performance.

For *pigs* (4) a mixture of dried potatoes, dried yeast and some barley, without any dairy by-products, forms a suitable rapidly fattening ration for young animals.

For *poultry* (5) as regards laying, and for the fattening of *geese* (6)

(1) VÖLTZ: *Jahrbuch der Versuchs- und Lehranstalt für Brauerei in Berlin*, 1910, p. 403; and *Zeitschrift für Spiritusindustrie*, 1910, Nos. 48 and 49.

(2) This high utilization figure is due to a better utilization of the basal ration caused by the addition of yeast.

(3) VÖLTZ: *Zeitschrift für Spiritusindustrie*, 1910, No. 47.

(4) VÖLTZ: *Wochenschrift für Brauerei*, 1911, Nos. 45 and 46; *Zeitschrift für Spiritusindustrie*, 1912, Nos. 1-4; *Landwirtschaftliche Jahrbücher*, 1912.

(5) VÖLTZ (Work not yet published).

(6) VÖLTZ: *Wochenschrift für Brauerei*, 1913, No. 11.

and the quality of their flesh, dried yeast proved equal to meat meal (calculating equal amounts of nutritive units).

With milch-cows (1) the use of dried yeast increases the butter-fat content of the milk.

In numerous cases it could be demonstrated that feeding the mixture of dried potatoes and dried yeast which has been recognized as very suitable, allows of considerable economy in the cost of keeping live stock. (The essential results of these researches are collected in the papers of Völtz, Paechtner and Baudrexel «On the utilization of dried yeast by live stock»: *Landwirtschaftliche Jahrbücher*, 1912).

The excellent results which have attended the practical use of dried yeast have caused such a demand for the new food, especially of late, that the supply has fallen decidedly short, notwithstanding the fact that between 1910 and 1913 the number of yeast-drying works has risen from 5 to 26 (of which 11 are in Germany). Correspondingly to the increased demand, the price has risen in the same period from 8s or 9s to 10s 6d or 11s 6d per cwt. But the highest limit is not yet reached, because the present price does not correspond to the real value of dried yeast, which consists to a great extent in the increased appetite that this food gives.

The German brewing industry alone is capable of turning out every year about 20 000 tons of this valuable food.

For farmers it will be interesting to learn that they have, often not knowing it, practised feeding yeast for a number of years, when they have used distillers' refuse. This refuse contains all the yeast which forms during the fermentation of the mash. In this connection the following calculation may be made:

100 parts in weight of distillery refuse contain 4 parts of yeast (calculated as compressed yeast). 11 gallons of this refuse per head of cattle daily contains 4.4 lbs. of yeast. For every 100 gallons of pure alcohol, 400 lbs. of yeast are formed, and as in the German potato distilleries about 61 000 000 gallons of pure alcohol are produced per year the farms that distil potatoes feed to their stock about 117 500 tons of yeast, equal to 35 425 tons of dry yeast.

The yeast content of distillers' refuse is not its least valuable part. For those farms which have no such refuse or possess it in insufficient quantity, brewers' dried yeast is a valuable substitute.

The yeast intended for stock feeding is not freed from its bitter principle before drying, but is worked up as it comes from the fermentation vat. The Institute for Experiments and Instruction in Brewing in Berlin has, however undertaken to free the yeast carefully from the hop resin that it contains, in order to prepare it as human food. The work done in this direction has led to surprising results. By means of a competitor it has been shown that this purified dried yeast (Food yeast) can be used

(1) VÖLTZ (Work not yet published).

in the preparation of a number of savoury dishes and renders good service in domestic economy. Experiments made on a number of persons have proved that this food yeast is wholesome and easily digested, and that to a great extent it can replace meat in human food. In the course of these investigations it was ascertained (1) that 1 lb. of this food yeast was equal in food value to 3.3 lbs. of average fat beef. But it is not only an article of food, but, as it has been demonstrated by a number of medical experiments, it is also a means of invigorating weakened organisms.

Its power of giving an appetite to debilitated subjects who suffer from inappetence is especially to be mentioned. This specific action of food yeast is perhaps due to its not indifferent lecithin content (N over 2 per cent.). The preparation of food yeast has been for the last eighteen months carried on regularly in a properly equipped purifying and drying installation, and the prepared yeast is daily gaining ground as an invigorating article of food. There is the prospect that this branch also of yeast drying will soon develop to an independent industry. The chief consumption of this food yeast will not be so much in private households as in the food industry, where there is a great demand for savoury material rich in protein. At the present price of 2s 2  $\frac{3}{4}$  d per lb., and considering equal quantities of nutritive elements, food yeast is cheaper than meat. And in the wholesale transactions with the food factories the prices might be considerably reduced.

According to the present state of the technique, all the excess yeast of German breweries could yield a yearly output of 13 750 tons of food yeast, equivalent to about 45 200 tons of medium fat beef. The raw material is sufficient to give rise to an important industry. How much of the excess of brewers' yeast will eventually be put to this use can not be foreseen. For the moment the bulk of dried yeast will be used for the preparation of yeast for live stock, and the production of food yeast will form only a branch of this industry.

It must also be remembered that the use of yeast as food is to a certain extent no novelty, for yeast has always been consumed in the shape of baker's goods, and in considerable quantities too, amounting in Germany alone to 147 000 tons (calculated as compressed yeast) per year, as the 49 000 tons of yeast required by the bakers becomes three times as much in the dough.

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(1) VÖLZ and BAUDREKEL: *Biochemische Zeitschrift*, 1911, Vol. 30, Part 6; and Vol. 31, Parts 3 and 4.

## The Control of the Japanese Fruit Scale (*Diaspis pentagona*) in Italy

by

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The experience of many years has shown that the artificial control measures used against *Diaspis pentagona* are of value only for the season in which they are carried out, and cannot be expected to get rid of the scales permanently or sufficiently to allow of the healthy growth of the plants.

This is the reason of the general complaints about these measures and the doubts entertained by mulberry-growers as to the value of the control, doubts which are all the more in evidence where the disillusion is older, that is where the scales have been present longest.

The natural methods are thus aimed, not at the extermination of the *Diaspis* from its present quarters, as this would be impossible, but at securing an activity sufficient to take the place of the artificial means, even if these were repeatedly and energetically employed, or in other words to prevent the *Diaspis* doing any damage.

Among natural means predatory insects are now no longer considered: indeed it was already foreseen two years ago, when they were first talked about, that they would not be sufficient. The only remaining enemy of any value is *Prospaltella berlesii*, a small species of the Hymenoptera which is the special endophagous parasite of *Diaspis pentagona*. I have already, in two earlier papers (1), described its introduction into Italy and its diffusion in the peninsula during the first three years, 1908 to 1911. We may now discuss the present state of affairs in the control of *Diaspis*. For this purpose it may be well to consider first what is going on in neighbouring countries, namely in Switzerland and over the border of the Empire of Austria-Hungary, where *Diaspis* is present to a serious extent.

In Switzerland it was only last year that *Prospaltella* was imported and let loose, and I have just found that it has established itself in the neighbourhood of Locarno.

In the Trentino (Austria), Prof. Osvaldo Orsi, of the Royal-Imperial Agricultural Institute of San Michele, began importing the insect in 1909; it has since been carefully distributed in the territories of Ala, Riva, Rovereto and Trent, altogether in 12 jurisdictions, comprising 37 communes; it was let loose at 28 centres on 1478 mulberries, and from these

(1) A. BERLESE: La *Diaspis pentagona* e gli insetti suoi nemici. - *L'Italia agricola*, 1911; also *Redia*, Vol. VI, Part 2, p. 298, 1911. ID.: Come progredisce la *Prospaltella berlesii* in Italia. - *Redia*, Vol. VII, Part 2, p. 436.  
(Author's note).

it is spreading out naturally or with assistance to all the surrounding trees. The excellent results attained are attested by a pamphlet published by the Provincial Agricultural Council of Trent (bibl. 1), and by several articles in different newspapers, among which I may note one by Prof. Orsi entitled: "*La Diaspis del Gelso è vinta*" (*The Mulberry Diaspis is defeated*), published in the organ of the Trent Farmers' Association (bibl. 13).

In Göritz the spreading of *Prospaltella* was carried out very carefully by Prof. Bolle, who obtained living examples even from Japan. The parasite is now well distributed in many centres and its good effects have recently been described by Prof. Bolle in a study entitled "*Die Maulbeerbaumschildlaus (Diaspis pentagona) und die Mittel zu ihrer Bekämpfung*" (bibl. 8). The Director of the Royal-Imperial Station of Agricultural Chemistry of Göritz, after giving the results of his experiments made in 1910, 1911 and 1912, comes to the conclusions that I had already reached, in particular that *Prospaltella* is an efficient means of controlling *Diaspis*, completely replacing the most efficacious artificial means carefully applied every year.

In Istria *Prospaltella* is now widely spread, according to Prof. Bolle, and the Royal Station at Florence possesses documents showing that it was introduced there in 1909.

The Austrian Government has twice sent competent persons to visit the centres of infection of *Prospaltella* and study its effect; as a result, the Government arranged an extensive distribution of the insect in the Trentino, Göritz, Istria and Dalmatia, as well as to silkworm observatories in Italian territory, and printed instructions, illustrated leaflets, etc., were prepared.

In our peninsula the oldest introductions of *Prospaltella* are at Vanzago, near Milan; Acerra, near Naples; the Palombina, near Ancona; Grottammare in the Marches; and Genoa. Vanzago supplied the bulk of the material for distribution, so that *Prospaltella* has become uncommon there; but all the same *Diaspis* is now very scarce, as the parasite spread naturally from the few infested scales which were left here and there in spite of the most careful search for material. In the country round the scale is abundant, but the parasite has not been assisted to spread. The effect of *Prospaltella* at Vanzago is referred to again in the *Bollettino dell' Agricoltura*, organ of the Lombardy Agricultural Society, for April 11, 1913; to this Dr. Del Bo, travelling lecturer in agriculture at Milan, contributes an article entitled "*L'esperienza di Vanzago conferma la bontà della Prospaltella*." (The results at Vanzago confirm the usefulness of *Prospaltella*). He says that a party of representatives from the Lombardy Agricultural Society, from the Association of Silkworm Egg Breeders, and from the travelling lectureship, were able to recognize that the *Prospaltella* "represents a providential assistance of enormous value against *Diaspis*" and "makes all other methods of control unnecessary." He concludes that farmers should have "unlimited confidence in the new means of control." At Acerra, Sig. Nuzzo's mulberry

plantation of 350 fine trees, which were formerly covered with scales, is now quite free, and for two years no attention has had to be given. Further, in all the country round the *Diaspis* is infested or else already totally destroyed. In the Palombina and at Grottammare the destruction of *Diaspis* is complete, and the same may be said at Genoa.

In 1909 other distributions of *Prospaltella* were made all over Italy, and in some forty cases it established itself. In 1910 about 2500 distributions were made, but hardly more than 50 per cent. were successful; this was no doubt due to the feeble numbers sent out, but with so many requests and only two small breeding centres the numbers were necessarily limited. In 1911 over 7600 lots were sent all over Italy, but again for the same reasons the cases of successful establishment were no more than in the previous year.

In 1912 *Diaspis* was very scarce on account of the weather: indeed in Lombardy and Piedmont in particular it had almost disappeared; for this reason little material was sent out, and this was obtained from Venetia and the Trentino, but its quality was excellent. The few hundred lots distributed came largely from Venetia; the successful cases reached 100 per cent., as ascertained by examination on the spot or from numerous samples sent in to the Royal Station.

The next oldest cases of establishment of *Prospaltella* after the ones mentioned above, made with material from these, date from 1909 (summer) and 1910 (spring) and are those already described in the Trentino, as well as a few on this side of the frontier. In all these the destruction of *Diaspis* is now complete from the cultural point of view, and includes a good many acres of land round the first centre of infection.

It is only in Piedmont that the destruction is not everywhere total and equally evident, and in this respect somewhat resembles the results of a year ago in less cold regions, so that we may reckon that even in our most northerly localities *Diaspis* will be completely destroyed in the coming year.

To give an example: in *Il Coltivatore* for Feb 20, 1913, p. 45, Prof. E. Voglino, director of the travelling lectureships in agriculture of Alessandria, reports on the mulberry plantations of Valenza, colonized by *Prospaltella* at the dates mentioned, and in which "at the end of 1912 the results were amazingly evident, so that there can no longer be the slightest doubt as to the efficacy of the Berlese method for the control of *Diaspis*. On the first mulberry tree colonized by *Prospaltella*, in 1909, I could not find on the 13th of January 1913 a single *Diaspis*, while at the beginning of the treatment it was literally covered with them." In other rows at various distances the parasitization is from 80 to 20 per cent. according to the distance from the original centre. In the woods 300 yards from the mulberries, parasitized *Diaspis* scales can be found on willows.

From Casalmongera Dr. Gabotto (bibl. 11) and the staff of *Il Coltivatore* quote observations and figures, and speak well of the work of the parasite.

In Lombardy, Venegono Inferiore (Como) is now completely protected by *Prospaltella*, owing to the work of Sig. Albé, who, with the assistance of the municipality, carried out a planned and regular distribution. At Desenzano the parasite has spread widely, and some areas, up to half a mile in radius round the centres of infection, have been cleared of scales by spontaneous spreading; indeed it may be said now that the infection is general in the neighbourhood. This is stated by Sig. Mazzoldi, of the Chamber of Agriculture there, as well as in the *Provincia di Brescia*, Nov. 29, 1912, and April 17, 1913, and in other Brescia journals of the latter date.

At Silò the *Diaspis* has now been destroyed over several hundred acres about the first centre of infection. In the province of Bergamo Cav. Ambiveri has already freed the mulberries at Seriate, Bagnatica and Trescorre, in a radius of about a mile from the original infections, and in other places the travelling lectureship of Bergamo reports similar results (bibl. 9) at Seriate, Cavernago, Boccaleone, Torre Boldone, Gorle, S. Gervasio d'Adda, etc.

For Venetia it is impossible to mention all the places where *Prospaltella* has destroyed the *Diaspis* and followed it up over a large area round the original centre without any assistance; in some cases it has spread over remarkably large areas, for instance more than 75 acres in just over two years at Fregora (Vittorio Veneto) (bibl. 15), and a similar area in less than two years at Bovolon (Verona). It will suffice to say that complete and extensive destruction of *Diaspis* can be seen in the Province of Treviso: at Campocroce, Porzaro, S. Lazzaro, Fregona, Valdobbiadene (1), etc.; in the Province of Udine: at Codroipo, Cividale, Ippis, Faedis, Marzano, S. Giovanni di Marzaro, Latisana, Colloredo, Sacile, Careva di Sacile, S. Vito al Tagliamento, etc., to give only the names of the chief centres; many of these include several communes, Latisana, for instance, referring to some twenty localities; in this connection the travelling lecturer for Eastern Friuli writes me (March 11, 1913) that he has let out *Prospaltella* in 26 communes in his district: "In examinations on the spot in the last few days", he writes, "I have been able to observe new miracles of spreading: commune after commune completely invaded".

In a recent article in the *Giornale di Udine* (April 17, 1913 — bibl. 20) Prof. Parizzi (the above mentioned lecturer), speaking of *Prospaltella* in the districts of Latisana, Palmarova and Codroipo, declares that as a result of a single infection in 1909 there are now thousands and thousands; and that "a not inconsiderable number of growers can from their own experience bear witness to the efficacy of this convenient means of destroying *Diaspis*," and if artificial means of

(1) The effect is pointed out in the instructions for the diffusion of *Prospaltella* in 1913, issued by the travelling lectureship (bibl. 22). It is stated: Our experiments from 1909 on show clearly and decisively that *Prospaltella variator* destroys *Diaspis pentagona* so completely as to render it culturally harmless. (Author's note).

control are not used "within the year *Diaspis* will have disappeared from numerous large centres and in two or three years from the whole district."

In all these cases it is not a question of only the single mulberry tree which was colonized nor yet of just a few near it, but of vast zones of land, and generally of whole communes. As an example I may mention the case of Ippis, from which the deputy-mayor writes me: "Nowadays we hear nothing of *Diaspis*; its ravages are merely a matter of history".

In all the other Provinces of Venetia the state of affairs is much the same as in the two mentioned, except that the proportion between the centres of *Prospaltella* infection and those of *Diaspis* infestation is not always the same. The whole list is too long to quote, but the following may be mentioned: Mira and Mirafior in the Province of Verice; Este, Cittadella, Bassano, Due Ville and Nosedo in the Province of Verona.

All these examples agree perfectly with the result predicted for the work of *Prospaltella* within two years of its introduction into a place, that is the total destruction of *Diaspis* as an agricultural pest in a zone of greater or less extent round the centre of colonization. The most satisfactory fact as to the value of the parasite is the *unanimous* conviction to this effect, now firmly rooted and warmly expressed, of all the landowners and countrymen who have had the benefit of *Prospaltella* for their mulberries since at least 1910.

In almost all the places in which the parasite has been introduced at least two years the following occurrence noted by Prof. E. Voglino is being repeated: "The countrymen about Valerza have got to recognize the parasitized scales perfectly, and as they all have small properties, they pick out at pruning time twigs with plenty of scales and their parasites on them, and take them to fasten on their own trees". (*Il Coltivatore*, Jan. 20, 1913, p. 46). Prof. Gastine, (referred to below) states that in some parts of Venetia the countrymen who have got material infected by *Prospaltella* make a regular trade of it, selling twigs of a foot long with 60 to 80 per cent. of parasitized scales for 5*d* a piece. So great is the demand, that in March many fortunate owners of parasitized mulberry trees had to watch them at night to prevent the material being stolen.

The condition of these less recent introductions is well reflected in the following sentences by Prof. Gastine, who was sent by the French Government to study the conditions as regards *Diaspis pentagona* in Italy (letter to Prof. G. Del Guercio, under date Nov. 26, 1912):

"I have made a long journey in Italy.... to visit places where I could examine the results obtained against *Diaspis pentagona* with *Prospaltella berlesii*. After going to Vanzago I went on to Udine, then into Göriz, to Trent, etc. I also made interesting journeys about Milan, and to Casalmonferrato.

"Everywhere I found the *Diaspis* attacked by *Prospaltella berlesei* and here and there in considerable quantities. Professors and growers alike were enthusiastic about Berlese's method, especially at Trent, and in Venetia at Codroipo, S. Vito del Tagliamento, etc. Remarkable results can also be seen at Casale Monferrato.

"After this long enquiry I return thoroughly persuaded that *Prospaltella* can control the *Diaspis* efficaciously from the cultural point of view".

The requests for material infected by *Prospaltella* received this spring were truly enormous; the mulberry twigs with *Prospaltella* parasitization sent out this March by the Institute number 25 365 for Venetia, 5105 for Lombardy, 3520 for Piedmont, 1520 for Emilia, 80 for Liguria, 315 for Tuscany, 200 for the Marches, 1020 for Umbria, 50 for the Abruzzi, 30 for Latium and 110 for Campania; total 37 315.

Besides this, thousands of lots of infected material are being spread about on the spot by the possessors of the older and richer breeding-grounds; to quote an example, the Hon. Count Rota, who had a single lot in 1909, obtained about 100 in 1910, about 500 in 1911 and 35 000 in 1912; with these he infected half his own mulberries and distributed a great lot gratis to his acquaintances, while this year he has abundance for himself and others. When we consider examples of this sort and that there are several dealers in silk eggs and silkworm observatories who breed *Prospaltella* to send out to their clients (1); also that there are agricultural bodies which, although possessing as much as 6 cwt. of infected branches, are so overwhelmed by requests that they have to apply to our nurseries for more; and lastly and most important, that the parasite spreads by itself in a single year over acres and acres of land under mulberries, it is easy to see how near is the time in which all that will remain of *Diaspis* is an unhappy memory.

(1) For example, one of these wrote me on Feb. 14, 1912: "I have thus sent out about a thousand lots, and am in no doubt about the results".

For 1913 we may quote the cases of only four firms in the province of Treviso who breed silkworm eggs: Cav. Mozzi, who has distributed 2000 lots; Sig. Zanetti, rather more than this number; Sig. Bidoli, 1500; and Sig. Fabris, of the Motta Estate, who sent out 3000.

Besides this there are the thousands sent out from the lectureship of agriculture of the same province: those sent by Prof. Sacchi, Director of the Provincial-Agricultural Institute of Treviso, actually exceeded 9000; Prof. Jelmoni, lecturer at Conegliano-Vittorio, over 2000; Prof. Di Gaddo, lecturer at Oderzo, 1000, etc. From this it will be seen how justifiable is the opinion of Prof. Sacchi, who wrote me on March 14, 1913: "from the infections already made and their complete success, as well as from the great number which I can undertake this year, I think I shall not be far wrong in predicting that a couple of years hence *Diaspis* will no longer be talked of in my district."

BIBLIOGRAPHY OF RECENT PUBLICATIONS (SEPT. 1912 TO APRIL 1913)  
ON THE CONTROL OF *Diaspis pentagona* IN UPPER ITALY.

- (1) *Almanacco Agrario* 1913. Relazione sull'andamento dell'Istituto Bacologico del Consiglio Provinciale di Trento, durante l'anno 1912. Trento, 1912.
- (2) G. BARBERO. Per la lotta contro la *Diaspis*. — *Antologia agraria*, Year III, No. 2, p. 39. Asti, February 28, 1913.
- (3) A. BERLESE. La *Diaspis pentagona* ed il modo di combatterla. — *Bollettino ufficiale del R. Ministero di Agricoltura, Ind. e Comm.*, Year XI, Series C. Part 7-8-9. Rome, August-September 1912.
- (4) A. BERLESE. La *Prospaltella* in Austria. — *Il Coltivatore*, Year 50, No. 7, p. 204. Casalmonterrato, March 10, 1913. Conclusions of Prof. Bolle's note mentioned here.
- (5) A. BERLESE. Effetti pratici della *Prospaltella berlesesi* in Italia. — *Il Coltivatore*, Year 58, No. 36, p. 606. Casalmonterrato, December 30, 1912.
- (6) P. BIDOLI. La distruzione della *Diaspis pentagona* a mezzo della *Prospaltella berlesesi*. Conegliano, 1913.
- (7) G. BOLLE. La Gelsicoltura del Giappone. — *Giornale di Agricoltura della Domenica*, Year XXII, No. 12, p. 92. Piacenza, March 24, 1912.
- (8) G. BOLLE. Die Maulbeerbaumschildlaus (*Diaspis pentagona*) und die Mittel zu ihrer Bekämpfung, with 20 figs., 1913.
- (9) G. FROSINI. La lotta contro la *Diaspis* del gelso e la diffusione della *Prospaltella berlesesi*. Bergamo, March 1, 1913.
- (10) G. GASTINE. *Diaspis pentagona* (Cochenille du Mûrier): Bibliothèque Vermorel, No. 5. Paris, 1912.
- (11) L. GABOTTO. I piccoli alleati dell'uomo. — *L'Avvenire*, Year XXXII, No. 10. Casalmonterrato, February 4, 1913.
- (12) G. LOUCHEUX. La Cochenille blanche du Mûrier. — *Cosmos*, Year 62, February 27, 1913, p. 242.
- (13) O. ORSI. La *Diaspis* del Gelso è vinta. — *L'Agricoltore*, organo del Consorzio agrario di Trento, Year XXX, No. 21. Trento, November 1, 1911.
- (14) G. PICCINO. La *Diaspis* e la Gelsicoltura. — *La Gazzetta d'Acqui*, Year XLIII, No. 9. Acqui, March 1-2, 1913.
- (15) *Diaspis pentagona* e *Prospaltella berlesesi*. — *L'Adriatico*, September 19, 1912.
- (16) A proposito di *Prospaltella*. — *Il Coltivatore*, Year 59, No. 3, p. 92. Casalmonterrato, January 30, 1913.
- (17) Contro la *Diaspis*. — *Gazzetta del Contadino*, Year XIV, No. 52. Trento, December 29, 1912.
- (18) E. VOGLINO. La *Prospaltella* a Valenza; anche i contadini sono ormai persuasi. La *Prospaltella* nei boschi. — *Il Coltivatore*, Year 59, No. 2, pp. 44, 45. Casalmonterrato, January 20, 1913.
- (19) C. DEL BO. L'esperienza di Vanzago conferma la bontà della *Prospaltella*. — *Bollettino dell'Agricoltura*, Year 47, No. 15, p. 2. April 11, 1913.
- (20) La *Prospaltella* nei distretti di Latisana, Palmanova, Codroipo. — *Giornale di Udine*, Year 47, No. 106, p. 2. April 17, 1913.
- (21) D. BORRA. Un enemigo de un enemigo de nuestra fruticultura. — *Revista Mûre*, Year I, No. 11. Buenos Aires, February 1913.
- (22) R. SACCHI. Istruzioni per la diffusione della *Prospaltella berlesesi* nel marzo 1913. — *Cattedra ambulante di Agricoltura, Trento*.
- (23) Per combattere l'infezione della *Diaspis pentagona* mediante la diffusione della *Prospaltella berlesesi*. — *La Dalmazia agricola*, Year VII, No. 5, p. 51. Zara, March 19, 1913.

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SECOND PART.  
ABSTRACTS

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AGRICULTURAL INTELLIGENCE

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GENERAL INFORMATION.

LEGISLATIVE  
AND ADMINISTRATIVE  
MEASURES

- 441 - The Project of the Ministry of Agriculture of Hungary regarding the Reclamation of the "Pusztá Hortobágy", - BALKÁNYI, BÉLA: in *Mezőgazdasági Szemle*, Year XXXI, No.3, pp. 125-131. Budapest, March 1913.

The Ministry of Agriculture is at present occupied with a scheme for reclaiming the extensive «Pusztá Hortobágy», the largest of the steppes of the vast Hungarian plain (Alföld), and belonging to the municipal town of Debreczen. This great «pusztá» is 59 700 acres in extent, and for centuries has only been used for grazing. The grazing rights are determined by an old statute in such terms that the inhabitants of Debreczen alone are entitled to use the land as a pasture on payment of a tax fixed by the general assembly of the town. The present system of using the pasture does not in any way fulfil the demands of modern agricultural progress, in that the virgin soil of the «Hortobágy» only serves as an indifferent grazing ground for two or three months of the year.

Seeing that the present management of the «pusztá» is not satisfactory and cannot meet economic requirements, the General Assembly of the town of Debreczen, after having offered opposition for many years, finally acceded in March 1912 to the project of the Ministry of Agriculture relating to the systematic reclaiming of the «Hortobágy», a scheme which was met by desperate resistance on the part of the small land owners of Debreczen, who did not wish to sacrifice their traditional rights to the modern evolution of agriculture.

The scheme embodied in the contract of the Ministry of Agriculture includes:

- 1) The reclaiming and dividing up of 17 000 acres for intensive cultivation and the erection of farm-buildings.
- 2) The creation of experimental irrigated State pastures, 4 250 acres in extent.

3) The improvement of the rest of the «puszta» for pasturage, the putting into effect of a new grazing regulation and the reorganization of stock-breeding.

The town of Debreczen has invited the service of the Ministry of Agriculture to mark out the above-mentioned extent of land for intensive cultivation and, at the same time, to determine the method of its division into leased farms.

The early realization of this reclamation scheme is the more desirable for the whole nation, seeing that it will mean a considerable increase in agricultural products, and, above all, lead to much improvement in stock-breeding in Hungary.

442 - A Ministerial Decree of November 30, 1912, regarding the Promotion of Rabbit Breeding in Prussia. - *Ministerialblatt der Königlich Preussischen Verwaltung für Landwirtschaft, Domänen und Forsten*, Year 9, No. 2, p. 23. Berlin, February 1913.

The decree sent to the Chambers of Agriculture advocates the encouragement of rabbit rearing in future for food and not for purposes of sport.

In the first place, those Rabbit Breeding Societies which aim at increasing and promoting the remunerative possibilities of rabbit-breeding and keeping should receive help from the Chambers of Agriculture.

This assistance might take the form of grants to enable these societies to establish covering stations, to combine for the purchase of doe rabbits, and to erect suitable hutchcs. The Minister of Agriculture advises the keeping of only a few breeds, and those the best flesh producers.

443 - Proposed Law on the Production of Wine and on the Wine Trade in the Republic of Uruguay. - *Revista de la Asociación rural del Uruguay*, Year XLII, No. 1, pp. 52-59. Montevideo, January 1913.

The executive submits to the Senate and to the Chamber of Representatives the proposal of a law of which the following are the chief provisions: Prohibition of the manufacture of artificial wines (natural wines are defined as those obtained by the alcoholic fermentation of the must of fresh grapes); complete liberty in the correction of natural wines; compulsory use of sealed vessels (bottles, demijohns, barrels, etc.) for all sales to the consumer; institution of officials provided with the necessary plant for the settlement of disputes between producers and the State, and for the study and the spread of good enological methods; prohibition of all blending of national wines with imported wines; increased taxation on foreign highly alcoholic wines.

The proposed law is followed by some information supplied by the "Comisión de Hacienda," from which it is seen that in 1912 there were in the Republic 2246 vine growers; 15 106 acres under vines and 23 700 000 vines, which produced 41 360 000 lbs. of grapes, yielding 2 321 000 gallons of wine. On account of the unfavourable weather prevalent during the year the crop was only about two-thirds of a normal crop.

444 - Encouragement to Farming and Stock Breeding in the State of Colima, Mexico. — *El Agricultor*, Year VII, Vol. VII, No. 73, pp. 625-626, Merida, January 1913.

By the Government Decree No. 25 of December 25, 1912, a bonus of 5 pesos (about 10 shillings) is granted for every thousand fruit trees that are planted by any farmer or native or foreign company that will devote itself, after the publication of this Decree, to the planting and cultivation of fruit trees. This bonus will be paid when the first crop of fruit is gathered. All kinds of fruit suitable for exportation may claim the bonus. Thus at present the following are included: lemons, oranges, tangerines, avocado pears, chestnuts, mamme apples, ascherries, custard apples, mangoes, walnuts, apples, cherries, pears, peaches, quinces and olives.

A bounty of 5000 pesos (about £ 500) will be given to the farmer or native or foreign company that will plant and cultivate up to the gathering of the first crop two hundred thousand bararas of the Roatan type. Farmers who dispose of only 12 to 25 acres of land and who plant the whole of them with the above variety will get a bonus of 15 pesos (about 30 shillings) for every thousand plants. The following bounties will also be given: 2000 pesos (about £ 200) for every 200 000 stone pines (*Pinus pinea*) that are planted, and proportional sums to small landowners who will plant upwards of 10 000 such trees; 50 pesos (£ 5) for five years for every hectare (2.47 acres) of land under vegetables consumed in North America such, as onions, garlic, tomatoes, egg-plants, artichokes, cucumbers; 5000 pesos (about £ 500) paid down once to whoever lays down 750 acres to canteloup melons.

For five years the land devoted to the above mentioned crops will be free from land taxes and the buildings used for packing the fruit or storing packing material will be free from State and municipal taxes. Banana meal factories will enjoy the same exemption.

All the irrigation works erected in future shall be free from taxes for ten years. Neither the amount of capital employed nor the greater value thus acquired by the land will be taken into consideration.

10 pesos (about £ 1) will be paid once for every hectare (2.47 acres) of land planted to vines and 20000 pesos (about £ 2000) will be paid once for the planting of 100 000 coconut palms, and smaller proportional bonuses will be given to small landowners for every thousand coconut palms that they plant. On all urban holdings in the capital and in the principal centres of the State, which possess four coconut palms in bearing, the taxes will be reduced by one half and for five years. A reduction of taxes to the amount of 100 pesos (about £ 10) per thousand coconut palms will be granted to those landowners who will plant, on both sides of the railway from the station of Alzada to the port of Manzanillo, three rows of palms 26 feet apart and the same distance in the rows. This reduction will be allowed for the five successive years following the one in which the palms begin to bear.

A sum of 5000 pesos (about £ 500) is allowed to the executive for surveys in view of the sinking of artesian wells.

The first factory erected in the State for the treatment of fibre produced in the State itself will be free from any State or municipal tax for five years.

National or foreign capital invested in the breeding of improved breeds of cattle, horses, mules, goats, sheep, pigs or poultry will be exempt from any tax for ten years, and for five years if invested in agricultural machinery, decorticators or forage balers.

The executive is empowered: to take the necessary steps to ensure the subdivision of larded property while the general agricultural law is being carried out, and to promote the foundation, as soon as possible, of a mutual agricultural bank especially in the interest of small farmers.

445 - **The Economy of Agriculture in Great Britain.** CAMPBELL, P. P. in *North British Agriculturist*, Vol. 65, Nos. 7 and 8, pp. 108, 123, 140-141 Edinburgh, February 1913.

The writer gives a short description of the first beginnings of agriculture in general, and especially in England, and speaks of the influence which has been exerted by science, industry and legal enactments upon the development of agriculture in Great Britain right up to the present time. In his opinion, agricultural prosperity can only be attained by repopulating the country districts and extending the cultivation of cereals.

446 - **Agricultural Products of the French Tropical Colonies.** — BAILLAUD, E. (Secretary General of the Colonial Institute of Marseilles) in *Voordrachten over Koloniale Onderwerpen gehouden ter Gelegenheid van de Koloniale Landbouwtentoonstelling te Den Haag*, pp. 143-167. Deventer, January 1913.

*French West Africa.* — The most important product of this group of Colonies is the earthnut; the exports of this crop, chiefly from Senegal, having remained stationary for almost a century, suddenly began to increase when the country was opened up by the railway and more than quadrupled in 15 years, reaching 231 200 tons in 1910; this amount is probably liable to further increase as communications are established with other parts of the interior.

The exports of palm nuts and oil, which come chiefly from the Ivory Coast and Dahomey, have also increased in the last few years since the railways were established. They were 20 250 tons of oil and 44 080 tons of nuts in 1910, it and the products of this industry will reach a much higher figure when the primitive and wasteful processes of the native cultivators are replaced by more scientific methods. Other exports which may be mentioned are:

Rubber: 12 430 000 lbs. (1910); a product of high quality and increasing in quantity every year.

Gum: to the value of £148 500 (1908).

Mahogany: 13 560 tons (1910).

Maize: 2 022 tons (1910).

Horns, Skins, and Wool.

DEVELOPMENT  
OF AGRICUL-  
TURE IN  
DIFFERENT  
COUNTRIES.

*Equatorial Africa.* — This group of colonies has not prospered as well as the former group owing, no doubt, to the fact that the land was divided up and granted to 20 land companies; a large number of these were failures, for they confined their attention to exporting the more easily obtained products of the country, such as rubber and ivory, without attempting to develop its other resources. New arrangements have now been made with the Land Companies and free trading established. Cocoa and coffee have been planted, but the results of this change are hardly evident yet in the export figures. In 1910 these were as follows: ivory to the value of £ 120 000, rubber £ 7 600 000, timber £ 120 000.

*Indo-China.* — Here rice is the staple product of the country, and forms over three-fifths of the total exports (1 249 000 tons in 1910). The crops are chiefly raised by natives, and then pass into the hands of Chinese middlemen and from them to the decorticating and bleaching factories. These also are exclusively controlled by Chinamen, and as the latter are somewhat given to speculation, crises in the industry are not infrequent and have an unfavourable influence on the prosperity of the country as a whole. Maize has also become an important export of late years, and in 1910 82 920 tons were shipped to France, where a preferential tariff secures a good price for it. Rubber, though exported in almost negligible quantities at present, is being planted largely on the "red soils" of Cochin-China which are specially adapted to its culture, and where it is estimated that it can be produced at 1 shilling per lb. Cassava, skins, silk and spices make up the remainder of the exports.

*Madagascar.* — Up to 1895 imports and exports were low, and counterbalanced one another, but at that date capital began to pour into the country and is now beginning to bear fruit as evidenced by a greatly increased production. In 1911 the exports had risen to £ 1 800 000 and exceeded the imports. This development is due to a large extent to the exploitation of native industries, but instead of being carried on by large land companies as in the African Colonies, it is the result of the personal enterprise of individual colonists. On the East Coast the latter are numerous and have now established nearly 700 plantations, most of which are producing vanilla. On the High Plains, colonisation has been less successful; coffee has proved a failure and the field has now been abandoned to native cultivators. On the West Coast, a good deal of land has been taken up by Europeans, and in many cases plantations of various kinds show signs of prosperity, but the major part may be considered as still in the experimental stage and it is difficult to predict the future from their results. Probably a system of subleasing the land to native cultivators with a division of profits will prove the most successful for this part of the country. Animal produce (including live and dead meat), mangrove bark, Cape peas (Pois du Cap) cassava, rice and vanilla are the chief exports at present, but undoubtedly several other tropical products, such as coffee, cloves, cocoa and coconuts, will shortly be exported in considerable quantities.

Amongst the older colonies, *Reunion*, *Martinique* and *Guadeloupe* are cultivated in an intensive manner, producing sugar, vanilla, coffee, cocoa, essential oils and cassava. Their population consists chiefly of the descendants of liberated slaves, and is somewhat lacking in energy and out of date in its methods of working; but with the introduction of modern scientific methods these islands should be capable of still further development.

447 - **The Condition of the Military Territory of the Chad at the Beginning of 1912.** — LARGEAU: in *Renseignements Coloniaux et Documents*, No. 2, pp. 73-91. Supplement to *L'Afrique française*. Paris, February 1913.

Information respecting stock-breeding and agriculture; the former is already furnishing considerable resources. The writer gives a table and figures dealing with the breeding of horses, sheep, cattle, camels and ostriches. With regard to agriculture, the chief cereal produced in the territory is millet; the following are also grown: earthnuts, sesame, maize, rice, Kanem wheat and lastly the Karité trec. Abundant and excellent hay is produced.

448 - **Agriculture in Paraná.** — SANTOS, E. in *A Fazenda*, Year IV, No. 32, pp. 2-6. Rio de Janeiro, January 1913.

The State of Paraná, with an area of 92 500 square miles may be divided into two belts: the coast, possessing a sub-tropical climate, and the high lands (from 650 to 3900 feet above sea-level), which enjoy a climate equal to that of the south of Europe. These latter include: 1) the plateau of Curitiba; 2) Campos Gerais, a great extent of pastures studded with woods; 3) the plateau of Guarapuava consisting of excellent pastures; 4) the valleys of the Iguaçu, Jejuiguassu, Pequiri and S. João rivers; 5) the valleys of the Ivahí and Tibagi, covered by rich forests. In the whole of the State the temperature ranges from 4 to 32° C. The network of streams is very extensive and is capable of supplying considerable quantities of power; thus, for instance, the fall of Sete Quedas or Guayra on the Rio Paraná could produce 80 millions H. P., and the Iguaçu fall 14 millions (the Niagara falls supply 3500 000 H. P.).

There is in the State a "Secretaria de Agricultura", it is divided into two sections: 1) Agriculture and Industry; 2) Inspection, Control of Pests and Agricultural Education. There is an Experimental Agricultural Institution at Baceachery near Curitiba; a Station of Animal Husbandry at Ponta Grossa; and an Agricultural and Stock-breeding Station of the "Sociedad Agrícola e Pastoral Central do Paraná," founded in June 1909. The chief agricultural products of the country are: maté, of which 99 501 043 lbs., worth £1696040, were exported in 1910-11, mostly to the Argentine Republic, Chile and Uruguay; timber, of which 27 963 681 cub. feet, worth £172706, (1) were exported in 1909

(1) The milreis being taken at 18 d.

(Ed.).

from the ports of Antonina and Paranaguá, and timber of trees other than *Araucaria brasiliensis* to the value of £ 17211 coffee; bananas; pigs, salted meats; cattle; horses and mules; hides. Silkworm rearing is developing regularly. During the last ten years 500 000 bunches of bananas were exported to France from the ports of Southern Brazil; in November 1912 28000 bunches were exported from Rio della Plata and 23000 from Santa Caterina.

449 - **Agriculture and Irrigation in the Valley of Ica, Perú.** - *Peru To-day*, Vol. IV No. 9, pp 481-490. Lima, December 1912.

As there is no rainfall on the coast of Peru, cultivation is only possible with irrigation. At present the cultivable area is not more than 640 000 acres, including 82 000 belonging to the valley of Ica. of these 45 000 are under actual proprietorship, 30 000 acres being cultivated.

The climate of the valley is mild and healthy. The temperature rarely exceeds 90° F. (26.6°C.) or falls below 46° F. (6.6° C.). During the winter and spring months there are heavy fogs and dews. During the summer months from January to April the Ica river brings down an average of 230 000 000 cubic metres (practically 190 000 acre-feet) of water, equivalent to 775 second-feet. But the fluctuations are so extreme that though the total canal capacity is about 60 cub. metres (2120 cub. feet) per second they are not sufficient to utilize the whole of the flow.

The erratic conditions of flow have given rise to the same method of irrigation as that practised in the delta of the Nile. This method consists in catching in the canals as large a portion of the floods as is practicable and distributing it as quickly as possible in relatively large volumes over the entire area to be irrigated.

The cultivated areas are arranged in basins which are inundated to an average depth of about 16 inches at each irrigation. The upper lands of the Ica valley receive two such irrigations a year, the lower lands frequently only one. Nevertheless these lands, about 30 000 acres, produce for exportation about £. 150 000 worth of agricultural products per year.

The substructure of the valley is formed by a deposit of water-bearing sands and gravels over 500 feet deep and confined between masses of impermeable igneous rocks. The water table varies in depth from 3 to 20 feet, and wells sunk to a depth of 100 feet below the surface of the water table will give during 3 or 4 months of the year, at least 22 gallons of water per minute for every metre (3ft. 3 in) that such wells are sunk below the water table, provided that they are properly spaced. C. W. Sutton C. E., Chief of the Irrigation Service of the Peruvian Government, calculates that 30 of these wells would not cost more than £. 130 000 including pumps and connections, to which should be added £. 50 000 to provide the power installation and distributing system for power, and £. 20 000 to provide the distributing system for water. The cost of operation might be reduced by using the power for other purposes during two-thirds of the year when not required for pumping, and by

using as fuel the wood of the cotton plants which is to-day burned on the fields.

With the actual system of irrigating only in summer, 242 to 273 lbs. of Peruvian cotton are produced per acre while if American cotton were sown and irrigated in spring it would produce at least twice as much. The amount of well water necessary for this advantage is only one-eighth of the total quantity required to produce a crop.

During the occupation of the valley by the Spaniards the lands that were under cultivation comprised principally vineyards; some of these still exist, where vines 150 years old are still producing fruit at the rate of 4 tons to the acre, and in a valley where there is an utter absence of all vine plagues. At present however, the principal and most profitable crop is cotton. The production of the valley, including Palpa and Nacsa, is about 50 000 cwt.

The cotton now grown is of two classes, the native Peruvian and American Upland, erroneously called in Peru Egyptian. The former produces 240 lbs. of clean cotton per acre, and that after eighteen months from planting, as against 475 lbs. per acre of the American plant after 5 to 6 months' planting. The latter has also the advantage of maturing earlier, thus escaping injury from low temperature, and of costing somewhat less to pick. For these reasons American Upland is rapidly taking the place of Peruvian cotton.

The plants usually interspersed with cotton in Ica are: Lima beans (*Phaseolus lunatus*), harvested in November, yielding from 60 to 80 sacks of 200 lbs. each per acre and worth 24s per cwt.; maize, sown in February and harvested in June, yielding about 10 sacks of 200 lbs. each per acre and sold f.o.b. Pisco at 6s to 10s per 100 lbs.; chick peas, sweet potatoes and *yuca*. The above results are obtained from such crops as have been irrigated only at the time of tilling the land and sowing. Where cotton is sown, the yield of these by-products is less than here given.

Besides the above-mentioned plants, in this valley fruit trees thrive in abundance; they are chiefly date-palms, figs, bananas, oranges, alligator pears, mangoes, custard apples and carob trees. The latter are only found in Peru in the departments of Piura and Ica. A young tree yields about 20 sacks of 100 lbs. each, worth 3s per sack. The bean, besides being a very valuable forage for animals is also used for making a strong tonic wine (algarrobina), as well as sweets. The wood is very hard and durable; it does not rot and is extensively used in building construction, and for railway sleepers. No sugar has ever been grown in this valley, but in certain northern zones of Ica experimental plantations of sugar and of rice have given such good results that their culture will shortly be established on an important scale.

Mr. Charles H. T. Townsend, entomologist to the Peruvian Government, furnishes the following information.

« The white scale of cotton which has constituted a serious plague for some years in the North of Peru is absent from the Ica region.

The cotton leaf caterpillar exists throughout Peru but is easily controlled by arsenical preparations if applied early.

«The cotton square weevil is present throughout the cotton districts of the Peruvian coast strip, but as it can persist as a plague only under conditions of considerable humidity, it remains inactive for several months at a time, the severity of its injury being thus greatly lessened».

450 - **Agricultural Conditions in Bohol, Philippine Islands.** - SOUTHWICK, E. F., *The Philippine Agricultural Review*, Vol. VI, No. 1, pp. 34-39. Manila, January 1913.

This paper gives a general description of the island of Bohol and of the chief crops grown there: corn [maize] is grown very generally throughout the island and constitutes the principal food of the people; rice is sown on dry soil and transplanted to terraced paddies; tobacco is not as important a crop as it should be; sugar cane for the market is grown chiefly on the fertile plains between Tubigon and Calape; coconuts are grown for copra and tuba especially; Manila hemp and maguey are not much grown. The most common fruits are bananas, mangos, and papayas; chicos and pineapples are produced in limited numbers, while citrus fruits are very little grown. Guava grows wild everywhere, but it is not cultivated. Camotes are the vegetables most grown; they are not attacked by locusts. Mungos are usually planted among maize. The grazing of carabao and cattle is chiefly practised on the northern plain.

RURAL  
HYGIENE

451 - **The Relation Between Land Reclamation and Malaria.** - ROSSI, GIACOMO, *Grande e piccola bonifica nel Mezzogiorno*, pp. 8. Naples, 1912.

According to the Parliamentary Report of 1906, the land to be reclaimed in Southern Italy is divided as follows:

Molise . . . . .	18 321
Caserta Province . . . . .	44 359
Benevento Province . . . . .	481
Near Naples . . . . .	2 049
Near Salerno . . . . .	37 807
Reclaimed land of the Nola torrents * . . . .	35 419
Foggia Province . . . . .	89 581
Lecce Province . . . . .	12 351
Basilicata . . . . .	41 458
Cosenza Province . . . . .	66 080
Catanzaro Province . . . . .	20 033
Reggio Calabria Province . . . . .	11 884

\* In this case it is only a question of the regulation of torrents, without any hygienic object.

Thus there are in Southern Italy 380 918 acres to be reclaimed, or rather in the course of reclamation, since schemes have been made, funds allotted, and in some cases the work is in course of completion. At present large operations are in progress in the lower basins of the

Volturno and the Sele. Nevertheless, the malarial zones are much more extensive than the areas, to be reclaimed. As a typical example of this, the writer cites Apulia, where only about 103 000 acres require reclaiming out of an area of 5 907 000 acres, and where there are 184 malarial communes as against 53 free from the disease. Except in the vine-growing districts (723 000 acres) extensive cultivation predominates here. Further, it must be noted that marshes almost always represent but a very small fraction of the land to be reclaimed, which also includes the reclamation radii, *i.e.* land which will derive hygienic benefit from reclamation. Thus, in the plain of Eboli, the marshes are only 4 016 acres in extent, while the reclamation radius includes 86 765 acres.

It is therefore inaccurate to establish a direct connection between marshes and malaria, and an illusion to believe that large reclamation operations would suffice to bring about the disappearance of malaria. "The severe malaria which prevails in so many southern districts is not due to existence of true marshes and swamps, but to the want of an intense and systematic cultivation of the soil, to the neglect of the land, to the absence of drainage ditches and of deep ploughing, all causes of the spread of malaria, since they easily permit of the temporary and permanent accumulation of stagnant water on the surface of the soil and the consequent development of *Anopheles* larvae. . . Thus, the agricultural and hygienic renaissance of the South depends less upon large than upon small reclamation operations " on the reclamation wrought by the field ditch and the spade. ,,"

452 - Grants for Agricultural Education and Research in England, 1911-12. - Board of Agriculture and Fisheries. Annual Report on the Distribution of Grants for Agricultural Education and Research in the Year 1911-1912, pp. 112. London, 1913.

EDUCATION  
AND EXPERIMENTATION IN  
AGRICULTURE  
AND FORESTRY

On January 19, 1912, revised arrangements were made between the Board of Education and the Board of Agriculture and Fisheries, the effect of which is to place Agricultural Education under the supervision of the latter to which is now assigned the responsibility, not only for Universities and Colleges in which advanced work is being done, but also for Farm Schools and other provision for Agricultural Education on a lower plane than that of the Agricultural Colleges, which formerly were under the supervision of the Board of Education.

In the financial year 1911-12, the grants awarded in aid of educational institutions amounted to £18 840. The accounts sent in by the Local Authorities of the different counties, and which refer chiefly to 1910-11, show that they are spending in round figures a total of £80 000 per annum on Agricultural Education. The report gives a detailed account of the different grants and the objects to which they were devoted.

On August 10, 1911, the Development Commissioners recommended the Treasury to make the Board a grant for the furtherance of research in Agriculture; the Treasury approved the recommendation, and in a letter dated August 21, 1911, authorised the Board to give effect to the

scheme agreed upon, which included the improving of agriculture by providing technical advice for farmers. The general character of the scheme was indicated in a Circular issued by the Board on August 25, 1911. In order to secure the services of a number of carefully trained men for work in connection with the scheme, the Board proposed in each of the years 1911, 1912, 1913 to offer 12 scholarships of the value of £150 per annum tenable for three years. Having regard to the institutions available as centres, the Board arranged the counties of England and Wales in 12 "provinces," and have obtained a grant of £12 000 per annum from the Development Fund, which will be employed in providing trained specialists in each area.

A sum, not exceeding in the aggregate £30 000 per annum, has been set aside to provide aid for two Research Institutions for Plant Breeding, two for Animal Pathology, two for Agricultural Zoology, one Research Institution and two or three local experimental gardens for Fruit Growing and one Research Institution for each of the 11 groups of subjects mentioned, other than Animal Breeding. A sum, not exceeding £3 000 per annum, will be given in Special Grants for Research. "Interim Grants," to the amount of £9 263 were made to various Institutions from 1911-1912 to assist in the continuance of work already begun. The Treasury has sanctioned a payment from the Development Fund of £12 000 per annum to be distributed as grants for the purpose of assisting certain Institutions in England and Wales to supply technical advice to farmers and to provide for the investigation of local agricultural problems. The Board draws attention to the fact, that in order to gain the confidence of the farmers, it is necessary to convince them that the Staff of such Institutions is able to advise, not merely in regard to the general principles of cultivation and management, but also as to difficulties which lie outside ordinary experience and may need exhaustive investigation and patient research.

The Report gives as Appendix I, an account of the constitution and work of each Agricultural Institution which receives a grant, and the memoranda connected with the scheme are given *in extenso*.

453 - **The Practical Rural Economy of the Royal Agricultural Colleges and Agricultural Schools in Hungary, 1909-1911.** — NYÁRÁDY, JÁNOS. In *Közleked.*, No. 23, pp 805-806. Budapest, March 22, 1913.

For about four years the State Agricultural Schools and Colleges have been endeavouring to increase their revenues as much as possible, both with a view to augmenting their receipts and also to afford their students a practical object lesson.

The writer sets forth (according to the very carefully kept books of these institutions) the system of agricultural economy practised by professional institutions in general, their stock of cattle, implements, crops and revenues, as well as their budget and the balance of agricultural operations during the period 1909-1910-1911.

There are 5 State Agricultural Colleges and 19 Schools in Hungary. The total area cultivated by these institutions is 15 767 acres, of which 2 366 acres belong to the State, 5 172 acres are placed gratuitously at its disposal by private individuals, and 8 228 acres are rented.

The institutes have proved that there is no bad soil, having brought into bearing completely exhausted soils (belonging to the second category above) by means of long and costly operations of clearing and improvement.

Of the total area, 11 916 acres are under farm crops, 394 acres are gardens, 2 867 acres are forest, while 354 acres are worked by the students and 236 acres are turned to various uses. There are 7 867 acres of arable land, of which the following areas have been manured:

	Farmyard manure — acres	Chemical manures — acres
1909 . . . . .	1 506	176
1910 . . . . .	1 537	747
1911 . . . . .	1 688	1 158

The use of chemical manures is becoming increasingly general. The following table gives the yields per acre of the chief crops:

Year	Wheat	Rye	Barley	Oats	Maize in cob	Mangold	Potatoes	Lucerne hay	Clover hay	"Three Months," hay (1)	Dry maize for forage	Meadow hay
	bu.	bu.	bu.	bu.	lbs.	tons	tons	cwt.	cwt.	cwt.	cwt.	cwt.
1909 . . . . .	18.2	27.6	29.3	35.6	24.80	16.0	3.8	36.0	20.7	22.6	12.9	11.1
1910 . . . . .	22.0	25.3	18.9	19.9	31.20	18.8	5.0	36.4	24.0	22.5	11.1	19.5
1911 . . . . .	26.6	27.0	24.5	37.0	24.60	13.3	3.9	30.4	19.3	23.2	35.3	16.2

(1) A mixture of vetches and cereals.

(Ed.)

The cereal crops are used primarily to supply the various institutions, the surplus being kept for seed or else sold.

The total number of live stock was as follows.

Year	Horses	Draught oxen	Oxen for fattening	Breeding cattle	Sheep	Pigs
1909 . . . . .	328	386	43	1 220	2 864	1 185
1910 . . . . .	330	365	47	1 256	3 024	964
1911 . . . . .	357	393	37	1 357	2 866	983

This total was somewhat modified during the three years by purchases from abroad and at home; in order to meet present requirements, the Institutes are about to acquire first-rate breeding stock of all kinds.

The total capital of the Institutes increased by £ 16 170 from 1909 to the end of 1911. It was divided between the three years as follows:

Year	Land		Buildings		Dead Stock		Live Stock		Production		
	£	s	£	s	£	s	£	s	£	s	
1909 . . . . .	81	185	4	59 500	8	15 921	3	30 185	12	10 375	17
1910 . . . . .	82	051	16	61 537	14	18 197	0	32 237	1	21 695	6
1911 . . . . .	80	915	11	66 060	13	19 187	1	35 662	11	25 576	18

The following is the balance of the three years.

Year	Gross Revenue						Total Expenses	Net revenue				Deficit				
	Total receipts		Increase of capital		Total gross revenue			Total		per acre		Total		per acre		
	£	s	£	s	£	s		£	s	£	d	£	s	£	d	
1909 . . .	22 424	8	4 410	12	26 835	0	25 232	8					1 397	8		
1910 . . .	25 346	4	12 503	1	37 849	5	31 623	19	6 225	6	10	5	—		—	
1911 . . .	32 304	7	9 161	3	41 465	10	32 401	2	9 064	8	15	2	—		—	

451 - **The Agricultural College at Grignon (France).** *BRIOTIGNIERE, L.* in *La Vie agricole et rurale*, Year 2, No. 15, pp. 405-409 Paris, March 15, 1913.

A short account of the history of the Grignon Agricultural College; the advantages offered to the students by the estate and agricultural industries attached to the College.

455 - **The Canadian Experimental Farms Report for the Year ending March 31st 1912.** - *Department of Agriculture, Ottawa, 1912*

This is the most comprehensive report so far issued by the Department of Agriculture at Ottawa, as it deals with every phase of Canadian agricultural activity. The first 230 pages are devoted to the reports of officials whose head quarters are at the Central Farm at Ottawa, the remaining 216 pages dealing with experiments and investigations that are being carried on at the ten Branch Farms and Stations distributed over the different provinces.

The Dominion Agriculturist, J. H. Grisdale, deals with the live stock and rotation experiments at the Central Farm, giving some interesting

detailed tables of costs of working and production: amongst these may be mentioned that of the dairy herd, where it is shown that yields varying from 3 000 lbs. to 11 000 lbs. of milk per head per lactation period were obtained at a cost varying from 2s 6d to 5s 4d per 100 lbs. of milk. The data of the rotation experiments are also most complete, the returns per acre for each crop and for the whole rotation affording interesting comparisons. The net profits per acre vary from 22s to 38s under the different systems.

The Dominion Cerealists, Dr. C. E. Saunders, announces a new wheat which promises to become of great value in the more northerly sections of Canada as it ripens fully a week earlier than Marquis. This new variety, which has been named «Prelude», is also a good yielder and ranks very high in baking strength.

The Report of the Dominion Chemist, Dr. F. T. Shutt, is dealt with separately (1).

The Horticulturist, the Entomologist, the Botanist, and the Poultry Manager all present reports of the work done during the year in their respective branches.

The reports of the Superintendents of the branch farms and stations are of special value to farms in the various provinces and districts served, as the work undertaken, in each case, is planned to study the local problems of crop and live stock production.

456 - **A Proposed Tropical University.** - *Agricultural News*, Vol. XII, No. 212 pp. 49-51, and 59, Barbados, February 15, 1913.

This article sets forth the great advantages which a Tropical University on the spot offers to colonists and gives the reasons which make the British West Indies an especially suitable place for the establishment of such a University. In the same number of the *Agricultural News*, the article from the *Times* of January 23, entitled "The Case for a Tropical University" is given *in extenso*.

457 - **The Work of the Agricultural Association of Tunis.** - L'Association agricole, *Bulletin Mensuel de l'Office du Gouvernement Tunisien*, Year VII, No. 63, pp. 21-24, Paris, February 15, 1913.

The Agricultural Association of Tunis has been divided into two sections, owing to the extent of its field of operations and in order to give sufficient scope to its developing energy. These two sections are entitled, the Central Co-operative Society (Coopérative centrale), which deals with the business transactions connected with trade; and the Tunisian Farmers' Society (Société des Agriculteurs de la Tunisie), which occupies itself with technical agricultural questions. In 1912 the latter studied and dealt with many important matters, such as the organisation of markets of the nature of exhibitions, the founding of insurance companies, and the use of mechanical power for ploughing.

AGRICULTURAL  
INSTITUTIONS

(1) See below, No. 474.

(Ed.).

So far, the Association has established 26 Agricultural Credit Banks, of which the turnover in 1912 amounted to £ 95 360. It is proposed, during the current year, to open 10 Agricultural credit Banks for natives, each with 20 to 30 members. Three Breeders' Associations have been established at Beja, Murchar, and Medjez-el-Bab; while others are to be started in the near future. The question of the advantages of forming associations for mechanical ploughing and of the creation of Long-Credit Societies requires further consideration. The Council of the Committee of the «Coopérative centrale» is also occupied with the important work of forming Associations for the purchase of manures and for the sale of cereals.

- 45<sup>b</sup> - **The Necessary Changes in the Organisation of the Procedure Relating to the Sub-division and Re-adjustment of Holdings.** - PLAHN: in *Deutsche Landwirtschaftliche Presse*, Year XXX, No. 9, pp 99-100. Berlin, January 20, 1913.

The writer wishes that the procedure relating to the readjustment of holdings should be altered in the following three important particulars :

- 1) The General Commissioners should no longer, as heretofore, exercise legislative and executive powers, but that these functions should be entirely separate.
- 2) The execution of the designs should not be entrusted to the Special Commissioner (as a rule only a legal specialist), but should devolve by law upon the technical expert who surveys the land.
- 3) All the owners of property interested in the matter should have the right of a Public Company to negotiate a common loan.

- 459 - **The Formation of Horticultural Committees in the Prussian Chambers of Agriculture.** - *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 9, pp. 63-64. Berlin, March 3, 1913.

A Ministerial Decree of January 28 advises the formation of Horticultural Committees in the Chambers of Agriculture in Prussia, and gives suggestions as to their composition and duties.

AGRICULTURAL  
SHOWS AND  
CONGRESSES

- 100 - **Agricultural Shows.**

*Argentine Republic.*

1913. Oct. 12-17. Corrientes. — Agricultural, Live Stock, and Industrial Show, organised by the «Sociedad Correntina de Hacendados».

*Australia: New South Wales.*

1313. July 17-18. — The Deniliquin Pastoral and Agricultural Society. L. Harrison, Secretary.  
Aug. 19-22. Wagga. — Murrumbidgee Pastoral and Agricultural Association. A. F. D. White, Secretary.  
Aug. 26-28. Gunnedah Pastoral, Agricultural and Horticultural Association. M. C. Tweddle, Secretary.  
Aug. 27-28. — Parkes Pastoral, Agricultural and Horticultural Association. G. W. Seaborn, Secretary.  
Sept. 2-3. — Ariah Park Pastoral, Agricultural, Horticultural and Industrial Association. J. N. Taylor, Secretary.

- Sept. 2-3. — Wellington Pastoral, Agricultural and Horticultural Society. A. E. Rotton, Secretary.
- Sept. 3-4. — Germantown Pastoral, Agricultural and Horticultural Society. J. S. Stewart, Secretary.
- Sept. 3-5. — Junee Agricultural Association T. C. Humphreys, Secretary.
- Sept. 9-11. — Young Pastoral and Agricultural Association. T. H. Tester, Secretary.
- Sept. 9-11. — Albury and Border Pastoral, Agricultural and Horticultural Society. W. I. Johnson, Secretary.
- Sept. 16-17. — Coolamundra Agricultural, Pastoral, Horticultural and Industrial Association. M. T. Williams, Secretary.
- Sept. 16-17. — Cowra Pastoral, Agricultural and Horticultural Association. G. S. Fisher, Secretary.
- Sept. 23-24. — Murrumburah Pastoral, Agricultural and Industrial Association. J. A. Foley, Secretary.
- Sept. 30 Oct. — Hay Pastoral and Agricultural Association. Secretary, G. S. Camden.

*Belgium.*

1918. May 3 — June 1. Liège, Palais des Beaux-Arts. — International Documentary Exhibition of Ornithology, and of Entomology and Botany from an Ornithological Point of View. General Secretary: L. Cuisinier, 155 Rue de Bruxelles, Ans.
- May 13-23. Brussels, Palais du Cinquantenaire. — International Horse Show, organised by the Royal Horse Society of Belgium. Rue des Deux Eglises, 33, St. Josse-ten-Noode Bruxelles.
- June 14-16. Ghent. — Temporary International Poultry Show at the Ghent Exhibition. For particulars apply to Boulevard de la Senne, 90, Bruxelles; or Chaussée de Bruxelles, 4, Leideberg (Ghent).

*France.*

1918. May 5 - Oct. 15. Vichy. — International Exhibition. One section is devoted to agriculture and horticulture; others to machines and motors. For information apply to: Direction de l'Exposition Internationale, 18 Rue Scornin, Vichy.
- Paris, « Société Nationale d'Horticulture de France », 84 Rue de Grenelle. Shows arranged by the Society: June 12. — paeonies, irises, orchids; July 10 — roses, vegetables; Aug. 14. — gladioli, plants in bloom; Sept. 11 — dahlias, asters, fruit; Oct. 9 — early Chrysanthemums, orchids, fruit.
- June 6-9 Versailles, Park. — Exhibition of Horticultural Products, organised by the Horticultural Society of the Department of Seine-et-Oise. Apply to M. Hueber, General Secretary of the Society, 40, Boulevard du Roi, Versailles.
- June 9-15. Chambéry (Savoie). — Horticultural Show.
- June 9-15 Chambéry. — Interdepartmental Agricultural Show. This will include live stock, horticultural products, Savoy wines, agricultural machines, spraying machines, etc.
- June 12-15. Evreux. — Poultry Exhibition in the enclosure of the central Exhibition, organized by the Society of Norman Poultry Breeders (Société des Aviculteurs Normands), 9 Rue Josephine, Evreux (Eure).
- June 14-22. Grenoble (Isère). — Horticultural Exhibition.
- June 18-12. Paris. — Central Show of Stud Horses and Asses. Prizes will amount to 232 900 frs.; 17 cups, 464 medals. Apply to: « Ministère de l'Agriculture, Direction des Haras 2e Bureau ».
- June 21-23. La Rochelle, Casino municipal — General Horticultural Show organized by the Horticultural and Viticultural Society of Lower Charente. President: M. Lefebvre, 4, Rue Réaumur, La Rochelle; Secretary, M. Morin, 57 Rue Alcide d'Orbigny, La Rochelle.

June 28 - July 6. Saint-Mandé (Seine). — National Exhibition of Horticulture and Fine Arts organized by the Horticultural Society of Vincennes. For particulars respecting the Horticultural Section, apply to M. F. R. Pacotto, President of the Organisation Committee, 11 Rue de la Marseillaise, Vincennes.

July-October. Brest, Place du Château — Exhibition of West France. Amongst others there will be a section for Agricultural machines and Implements. Apply to: M. le Président de l'Exposition de l'Ouest de la France, Brest.

July 5-7 La Basée. — Annual Show of the Agricultural Comice of the Arrondissement of Lille. Apply for information to the Secrétariat général du Comice 112 Rue de Paris, Lille.

July 12-14 Senlis (Oise). — General Horticultural Show organised by the Société d'Horticulture de l'arrondissement de Senlis. For particulars apply before June, to M. Lelièvre, Secretary General of the Society, Senlis.

August 15-17. Montereau (Seine-et-Marne). — Fifty-first Show organised by the Société d'Horticulture de Melun et Fontainebleau. Apply to M. Zanotte, Secretary, Rue de l'Hôtel-de-Ville Montereau.

November. Paris. Twenty-fourth Show of the Société nationale d'Aviculture de France. Cold Storage Installation, Exhibition of the Automobile Club of France. The latter club, wishing to show the advantages accruing to farmers from the use of refrigerators driven by explosion motors, has organised an annual competition, with prizes, for the owners of the best plant. This competition will be held for the first time in 1913, in the South-East region.

1913-1915. Show of Machines for cutting over coppices, organised by the Société des Agriculteurs de France, 8 Rue d'Athènes, Paris. A prize of 3000 frs. will be awarded in 1915 after two competitions in 1913-1914. Date of entry: May 31, 1913.

1914. Jan. 18-19 Lille. — Fifteenth International Exhibition of the Poultry Breeders of the North. Secretary General, M. Emile Desreumaux, 92 Rue Franklin, Roubaix. (Nord).

### *Germany.*

1913. Oct. 7-12. Berlin. Exhibition Halls of the Institute for Fermentation Industries. — Exhibition of Machines and Implements for the Brewing Industry, organised by the « Versuchs und Lehranstalt für Brauerei » of Berlin.

1914. Hamburg-Altona Central Cattle Market. — Show of Fat Stock. Apply to the Geschäftsführenden Ausschuss der Hamburger Mastviehausstellung at Hamburg.

### *Holland.*

1913 May 9-22. Bellevue (neighbourhood of Amsterdam). General Exhibition of Ornamental Plants and Flowers. Secretary of the Exhibition, M. G. F. Koopman.

### *Italy.*

1913 Aug. 15 - Oct. 15. Parma. — Exhibitions during the Celebration of the Centenary of Giuseppe Verdi. Horticultural Exhibition: Entries until May 31; apply to the « Cattedra Ambulante di Agricoltura », Parma. International Exhibition of Dairy Machines and Apparatus: opens Aug. 17. Provincial Exhibition of Butter and Cheeses: opens Sept. 20. Also: Mechanical Ploughing Competition; Exhibition of the Apennine Region; Farm Competition; Exhibition of Chemical Manures; Poultry and Rabbit Show; Pork Butchers' Exhibition; Wheat Show.

June. — November. Bologna, Halls of the Provincial Agricultural Office, 15 Via d'Azeglio. — Permanent Fruit Show organised by the Provincial Agricultural Office of Bologna. In addition in order to encourage fruit-growing, the Office, with the cooperation of the Ministry of Agriculture and various social bodies, is opening a competition among fruit-growers in the province for new plantations.

June-December. Bari. — Exhibition of Labour and Industry, and Agricultural Show. Apply to the « Direzione dell'Esposizione del Lavoro e dell'Industria, Bari ».

Competition among cooperative Dairies organised by the « Società Agraria di Lombardia », Milan, 2 Piazza Fontana; latest date of entry: June 30, 1913.

August. Potenza (Basilicata). — Live Stock Show.

October. — Live Stock Show of the Valsassina organised by the « Conizio agrario » of Lecco. Nov. 1-15 Florence. — Horticultural Exhibition (Chrysanthemums, Fruit, etc.); apply to the President of the Commission, 17 Via Bolognese, Florence.

1914. March-November. Genoa. — Exhibition of Colonial Agriculture.

*United Kingdom.*

1913. Sept. 20-27. London, Royal Agricultural Hall. — Twentyfirst Annual International Exhibition of the Grocery, Provision, Oil and Italian Warehouse and Allied Traders. Secretary, H. S. Rogers, Palmerston House, Old Broad St., London E. C.

*Union of South Africa: Natal.*

1913. June 6-7. Vryheid. — Show organized by the Vryheid Agricultural Society.

June 20-21. Greytown. Show organised by the Umvoti Agricultural Society.

*Uruguay.*

1913. October. Tacuarembó. — Second National Agricultural and Live Stock Show.

International Competition of identification marks for cattle, goats, sheep and pigs, organised by the Government of Uruguay. 27000 frs. are to be given in prizes and a sum not exceeding 270.000 frs. is offered by the Government for the purchase of the best system.

461 — **Agricultural Congresses.**

*Austria: Bosnia-Herzegovina.*

1915. Serajevo. — Sixth International Ornithological Congress.

*Belgium.*

1913. July. Ghent. — International Congress of the Wine Trade, organised by the « Comité International du Commerce des Vins, Cidres, Spiritueux et Liqueurs », 27 Rue du Louvre, Paris.

Aug. 2-3 Ghent. — International Congress for the Prevention of the Adulteration of Food Stuffs.

Oct. 26. Ghent. — Eighteenth Chrysanthemum Congress on the Occasion of the International Exhibition of Chrysanthemums and Fruit.

*France.*

1913. June 5. Périgueux. — First Congress of the National Union of the Horticultural Societies of France.

June 16-20 Paris International Forestry Congress.

1914. Sept 4-11. Havre. — Congress of the French Association for the Advancement of Science

*Russia.*

1914. St. Petersburg. International Agrogeological Congress.

*Spain.*

1913. Oct. 15-22 Madrid. — International Congress of Hydrology, Climatology and Geology.

1915. Madrid. — International Congress of Colonial Agroecology.

1915. April. Madrid — Second International Soil Congress.

*Switzerland.*

1913. July 6-9 Glaris. — Annual Meeting of the Swiss Forestry Association.

Aug. 4-7 Solothurn — Annual Meeting of the Swiss Forestry Association.

## CROPS AND CULTIVATION.

AGRICULTURAL  
METEOROLOGY

402 - **The Conservation of Snow: its Dependence on Mountains and Forests.** - CHURCH, J. E., jun (Agricultural Experiment Station, University of Nevada): in *The Official Bulletin of the International Irrigation Congress*, Vol. 1, No. 6, pp. 45-52. Salt Lake City, Utah, December 1912

Mountain ranges not only receive more snow than plains or valleys, but owing to the lower temperatures prevailing on their slopes, retain it for a longer period; they are, however, by their elevation, exposed to sweeping winds which dissipate and evaporate the snow, so that any means tending to break the force of the wind will also tend to conserve the snow, and render it available as an increased water supply to the plains and valleys during the summer. Crags are better wind breaks than trees and are found at higher elevations, but since the area covered by them is small, it is important not to neglect the less efficient substitutes.

In order to estimate the part played by forests in the conservation of snow on mountain sides, a system of surveys was begun in 1909, and the amount of snow was estimated at various points by means of a steel augur and a spring balance on which the amount of snow in the augur could be read off as inches of water. The regions studied included both the semi-arid and wind-swept eastern side of the Sierra Nevada with the adjacent lowlands, and also the moister and more sheltered basin of Lake Tahoe, where forests of varying types and densities occur.

The following is an example of some of the measurements obtained:

	water content of snow in inches	
	March 1	April 5
Base of Mount Rose (5500 feet):		
Reforested area thickly covered with young pines 30 feet high . . . . .	5.5	—
Deforested area dotted with clumps of bushes	2.4	—
Typical sagebrush area . . . . .	0.6	—
Summit of Mount Rose (10800 feet):		
Unforested lee slope protected from the wind	35.1	37.0
Forested slope at the timber line . . . . .	41.1	45.4

The figures show the value of trees in gathering and conserving the snow. At an altitude of 5500 feet the timbered area had nine times as much snow as the sagebrush area, while higher up the mountain side the forested slope had one-fifth more than the unforested lee slope above it, and the difference increased during the interval between the two sets of measurements.

The type of forest also has a marked effect on the accumulation and conservation of snow:

1	{	A forest of pine and fir with a maximum storage of 12.1 in. retained 0.6 in. on April 20			
	{	A fir forest	"	"	11.0 " 2.7 "
2	{	A very dense fir forest	"	"	10.9 " 0.9 April 25
	{	" " " with glades	"	"	16.5 " 3.2 "

The more open forest of pine and fir gathered more snow but retained less than the pure fir forest, but evidently the density of foliage is not the only factor in the conservation of snow for in the second series of measurements the presence of glades in the forest increased the storage power to a considerable extent. The ideal forest would therefore seem to be a dense one with a maximum number of glades, whose area bears such proportions to the height of the trees that neither the wind nor the sun can reach to the bottom. As to the kind of tree to be used for elevations below 8000 feet, fir has given the best results, while above that height mountain hemlock was most efficient.

A study has also been made of the increase in depth and density of the snow with elevation, and seasonal forecasts of the moisture stored in the mountains have been inaugurated which are of great value to the irrigator and to the user of water power.<sup>†</sup>

463 - **Meteorology in Canada.** - STUPART, R. F. (Director of the Dominion Meteorological Service) *Reprint from the Journal of the Astronomical Society of Canada.* March-April, pp. 75-87. Toronto, 1912.

After a historical sketch of the origin and growth of the Meteorological Service in Canada, the writer gives an account of the present scope of its work.

The headquarters of the Service are at Toronto, the present observatory and offices dating from 1909; there are also 543 other stations in the Dominion at which observations are taken; and 41 of these send bi-daily telegraphic reports to Toronto. The synoptic weather map has been adopted as a basis of weather forecasts and every effort has been made to broaden the field from which observations are obtained, but as the telegraph does not yet reach much beyond the southern margin of Canada the weather map exhibits a vast blank to the northward, and cloud observations showing motion of the upper air are fragmentary and unreliable. Recently, through the co-operation of the United States Weather Bureau, a most promising development of the daily weather map has been made possible by obtaining a certain number of foreign reports as follows: Ireland, Faeroe Islands, London, Stornaway, Malin Head, Blacksod Bay, Shetland Islands, Cuxhaven, Vladivostock, Shanghai, Lisbon, Azores, Turks Island, Havana, Honolulu and Manila, together With several United States stations in Alaska, also 12 stations in Russia and Siberia and one in Japan. These reports are received in Toronto at about 10 a.m. and together with the reports of the American continent are entered on a map of polar projection and show with fair certainty the distribution of pressure over the northern hemisphere. Within the last few years too, stations have been opened at 10 points in the north-land forming a chain from Northern Alberta to the Arctic Sea, and

though at present their reports are transmitted by mail and therefore only serve to extend the isobars of the past month into high latitudes, it is hoped that in the not distant future wireless stations will be placed in the far North, as reports from such stations would afford most valuable data for the preparation of weather forecasts.

During 1911 balloons carrying the Dines Meteorograph were sent off with regularity, and of 21 sent up, 12 returned to the central office with good records. The heights reached varied from 11.2 to 23.2 kilometres. The isothermal layer was found at an average height of 12.6 km. ranging from 16 km. on November 8 to 9.5 km. on December 7. The lowest temperature recorded was  $-70^{\circ}\text{C}$  at 15 km. on September 9. A kite station has been established at Agincourt, and observations of pressure, temperature, humidity and wind direction in the free air have since been obtained with fair regularity. The highest ascent yet reached is 2,408 m. (7900 feet) above sea level.

Newfoundland receives forecasts and storm warnings from the Canadian Service, but maintains her own Meteorological stations and publishes her own weather bulletins. It is expected that before long both the Canadian and the Newfoundland reports will be cabled to England, where they will be of decided use to the British Meteorological Office.

There are at present 110 storm signal stations, 72 on tidal water and 32 on the Great Lakes. The percentage of verification of forecasts for 1911 was 861 and of storm warnings 917. Mariners and fishermen pay close attention to storm warnings, while shippers of perishable goods consult the forecasts before shipping; moreover pilots of unsca-worthy craft, such as dredges and barges, at all times of the year, and of all vessels during the late autumn, allow themselves to be guided from port to port by the meteorological official.

SOIL PHYSICS,  
CHEMISTRY  
AND  
MICROBIOLOGY

- 401 - Application of the Ammonium Carbonate Method for the Determination of Humus to Hawaiian Soils. — RATHER, J. B. Texas Agricultural Experiment Station, College Station, Texas -- *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 3, pp. 222-223. Easton, Pa., March 1913.

The ammonium carbonate method for the removal of clay from humus has given uniformly good results on a number of the soil types of the United States, but on exceptional soils, like some of those of Hawaii, a slight modification of the method is necessary to remove the clay. The modification consists essentially in increasing the amount of ammonium carbonate to 2 gr. per 100 cc., and heating for one hour.

- 405 - The Intensity of Nitrification in Arid Soils. — STEWART, R. Contribution from the Chemical Laboratory, Utah Experiment Station, Logan, Utah, U. S. A. *Centralblatt für Bakteriologie, etc. II Abt.* Vol. 36, Nos. 10-25, pp. 477-490. Jena, February 15, 1913.

The writer discusses the common conception that nitrification takes place with great intensity in arid soils. The discussion of former data,

particularly of Hilgard, of Hadden and of the writer himself (1), leads to the following conclusions.

The conception that nitrification takes place with great intensity in arid climates rests primarily upon the observed fact that nitrates tend to accumulate in great quantities in certain arid soils. These nitrate accumulations always occur in connection with other water-soluble salts, such as sodium chloride and gypsum. No nitrate accumulations have been observed in arid soils free from other water-soluble salts. The alkali salts must therefore be intimately associated with the nitrates in one of two ways: 1st, they must exert a markedly favourable influence upon nitrification; or 2nd, the nitrates, like the other alkali salts, are of remote origin. From the data presented, it seems that the latter conception is the correct explanation.

The nature of the material out of which many of the soils of Utah and Colorado are formed seems to indicate that the nitrate accumulations found in these soils are undoubtedly of marine origin. The alkali occurring in many soils of Utah has been, in a large measure, deposited at the time of the formation of the shale; and, on the decomposition of this shale in the formation of the soil, the alkali has been incorporated with the latter. The passage of the water through the shale structure also washed out the soluble salts and carried them to the lower-lying land.

The presence of the nitrates in the alkali soils of the arid belts, in addition to the possibility of injury arising therefrom, is of significance from other points of view. It is a well known fact that alkali soils a year or so before «going bad» produce a luxuriant growth of plants, which may be accounted for by the movement of the nitrates up to the feeding range of the plants, while a year or so later the salts become so concentrated as to cause the death of the plants.

Arid soils are markedly poor in organic nitrogen, and yet the crops produced are excellent. The soils are not «nitrogen hungry». Hilgard has attempted to account for this apparent anomaly by the assumption that since the small amount of humus in arid soils is relatively richer in nitrogen than the humus in humid soils, this fully compensates for the apparent deficiency in nitrogen. An appreciation of the tendency of the nitrates, formed during the past ages, to accumulate in arid regions is suggested as a better explanation of this fact, and as being not open to the mathematical objection that has been raised against Hilgard's assumption. The writer maintains that there is no reason to assume that the accumulation of nitrates in arid soil indicates a rapid bacterial action at the present time; but that these accumulations indicate a concentration of the nitrates already in the soil formed by slow bacterial action in the remote past. The application of the irrigation water has simply furnished a medium by which the nitrates may move, or be moved, from one place to another. This source of nitrogen affords a clear explanation

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(1) See No. 775, *B.* April 1912; No. 807, *B.* June 1912.

(Ed.).

of the fact that in some cases the surface foot of cultivated arid dry-farm soils is richer in organic nitrogen than is that of the adjacent soils. The nitric nitrogen is obtained by the deep-rooted plants from the subsoil, converted into organic nitrogen by the plant, and then added to the surface soil by plowing under of the straw. The writer, however, fully realises that there is the possibility of ammonification, nitrification, and even nitrogen fixation taking place, to a certain extent, in some alkali soils at the present time; but from the data presented he assumes that the great accumulations of nitrates found in many alkali soils are of remote origin, being concentrated in their present position by the movement of the soil moisture.

Realizing fully that the term «alkali» must be so extended as to include not only the carbonates, chlorides and sulphates, but also the nitrates of the alkali metals, and recognizing clearly the source and method of nitrate accumulations in American arid soils, the writer believes one is in a position to work intelligently toward a solution of the problems presented by these unusual accumulations; and that the adoption of the methods of controlling the accumulations of alkali at the surface as suggested by Hilgard over twenty years ago, such as mulching, tillage and proper drainage, will convert the nitrate scourge into a blessing in disguise.

466 - **Movement of Nitrates in the Soil** (1). — ROUSSELLE, V : in *Annales de la Science Agronomique*, Year 30, No. 2, pp. 97-120. Paris, February 1913.

A confirmation of Schloesing's results that no appreciable diffusion of nitrate takes place in the soil, but that layers of nitrate are merely displaced either downwards by percolation or upwards by the capillary current.

467 - **The Effect of Toluol and Carbon Disulphide upon the Micro-Flora and Fauna of the Soil.** — GAINES, P. L. From the *Twenty-Third Annual Report of the Missouri Botanical Garden*. Dec. 16, 1912.

The work presented was undertaken to determine whether the theory advanced by Russell and Hutchinson (2) was adequate to explain the phenomena subsequent to partial sterilisation when applied to local soils.

The writer gleanes from the literature the following evidences regarding such treatment.

(a) A temporary decrease in total number of bacteria present, with a subsequent large increase: Krüger and Heinze, Massen and Behn, Pfeiffer, Hiltner and Störmer, Russell and Hutchinson, Hutchinson and Fred.

(b) An increase in oxidation: Fischer, Hesselink van Suchtelen, and Darbishire and Russell.

(1) See No. 109, B. Feb. 1913.

(Ed.).

(2) See No. 14, B. Jan. 1913; also RUSSELL, E. J.: Recent Investigations at Rothamsted. — B. March 1913 pp. 336-341.

(Ed.).

(c) An increase in ammonification: Störmer, Scherp, Laidlow and Price, Lipman, and Russell and Hutchinson.

(d) A detrimental effect upon nitrification: Warington, Scherp, Laidlow and Price, Perrand, Pfeiffer, Wagner, and Russell and Hutchinson.

(e) A beneficial effect upon nitrification: Brailles, Wollny Pagnoul, Störmer, Coleman, Lipman, Koch, and Fred.

(f) A detrimental effect upon nitrogen fixation: Störmer, Koch, Massen and Behn, and Koch and associates.

(g) A beneficial effect upon nitrogen fixation: Kranskii, Heinze, Lipman, and Fred.

(h) A detrimental effect upon denitrification: Wagner, Hiltner and Störmer, Störmer, Lipman and Fred.

(i) In regard to the effect upon nodule organisms: Wollny and Nobbe and Richter believed such effect beneficial, while Perotti, Koch and Fruwirth held the opposite view.

In addition to the above, Hiltner and Störmer, and Russell and Hutchinson have studied with some care the flora, as a whole, prior and subsequent to treatment; and they found that certain types were detrimentally and others indirectly beneficially affected. Russell and Hutchinson have also studied, more or less, the effect of such treatment upon the micro-fauna and, as a result, claim that all types of animal life, with perhaps one exception, are totally destroyed. Fred studied certain types of soil organisms in liquid cultures and found that the addition of certain strengths of various antiseptics stimulated development. The strength varied with different organisms and the stimulative effect diminished gradually from the maximum in both directions.

From the evidence brought forth in the experimental work the writer draws as justifiable the following conclusions:

I. That small quantities of carbon disulphide, toluol, and chloroform, such as have been used practically and experimentally (0.01-20%, optimum 0.2 %, when applied to the soils studied, exert a stimulative rather than a diminishing effect upon the total number of bacteria present.

II. That an application of such quantities of carbon disulphide and toluol does not have an appreciable effect upon the number of types of protozoa present in such soils as have been studied.

III. That a very marked increase in yield may be noted following such an application when no evident change occurs in total number of bacteria present.

IV. That, in the light of the recent work of Koch, Egorov, Goodsey, Fred, and others, with results presented in this paper, the theory advanced by Russell and Hutchinson to account for the increased yield following the application of such chemicals, appears not tenable for general application.

A list of 40 references is appended.

- 468 — *Denitrobacterium thermophilum* sp. nov.: a Contribution to the Life-History of Thermophile Bacteria. — AMBROŽ, A and CHARVÁT, J. Aus dem bakteriologischen Institut der K. K. böhm. technischen Hochschule in Prag — *Centralblatt für Bakteriologie, etc., II Abteilung*, Vol. 37, No. 1-3, pp. 110 + 1 figs. and 1 plate Jena, March 8, 1913

A description is given of a new denitrifying bacterium, *Denitrobacterium thermophilum*, which has been isolated from the soil, and of experiments concerning the nature of thermophilous denitrification, which process seems not to be confined to nitrates.

PERMANENT  
IMPROVEMENTS,  
DRAINAGE AND  
IRRIGATION

- 469 — Small Hill Reservoirs for Irrigation. — BRUTINI, A. Laghetti artificiali o serbatoi costruiti in collina e collegati fra loro a gradinata, per l'irrigazione in pianura. — *L'Italia Agricola*, Year 4, No. 7, pp. 169-171 + 2 figs. Piacenza, 1913.

This paper deals with a series of reservoirs (at present three) constructed by Prince di Lucedio, Carrega, on his estate Casino de' Boschi, near Sala Baganza, Parma, Italy.

The principle on which these constructions are designed may be adopted in all countries where arable lands in the plains are near hills or mountains.

Every hill or mountain is furrowed by small valleys in which spring or rain water flows, and as such valleys in some places wider and in others narrow, the plan was adopted of erecting successive barrages in the narrowest points of the valley, thus forming as many small artificial lakes, the arrangement of which, save for their greater dimensions, recalls the warping by steps as it is practised in Tuscany and in other countries for filling up ravines.

The base of every barrage is traversed by a cast-iron pipe provided with a vertical sliding gate. Provision is also made for surface overflow. The valley acts as a canal between the successive reservoirs, the lowest of which supplies the water for irrigation, and is replenished by the upper ones. Thus the separate reservoirs are together equivalent to one large one, but have the advantage of costing much less to build and to keep up.

As for the technical and economical details of the work done, it may be stated that the first reservoir built contains 494 000, the second 1 589 000 and the third 742 000 cubic feet of water. The latter will be fed by other higher reservoirs, one of which is already being built and will contain 3 108 000 cub. ft. The cost price per 100 cubic feet of capacity in the various reservoirs is the following: 1s 7d for the first reservoir, 11 3/4 d for the second, 1s 1d for the third and 1s for the fourth.

The dams are made of rammed earth laid in layers about 12 inches high, and watered, whilst being rammed, with lime water so as get a better cohesion between the particles of earth and greater impermeability to water. The base of the inner slope of the dam is twice the height of the latter, the base of the outer one being 1.5 times the height. The breadth at the top corresponds to the formula  $3 + \frac{5}{17}(h-3)$ . The dam is sunk into the ground to a depth of 6 feet.

Sig. Pouzi, the engineer of work, states that these reservoirs have nothing to fear from silt, because the water that reaches them is clear, coming as it does from catchment basins (about three-quarters of a square mile) covered with woods and pastures. Should it, however, be necessary to scour the bottom of the reservoirs, it can be done by allowing the water to issue under a head of 6 feet and if necessary the mud could be previously stirred up.

The amount of water available in the reservoirs from the middle of May to the end of June is 5 933 000 cub. feet. This quantity distributed in four times in July and August amounts for each irrigation, lasting 196 hours, to 1 483 250 cub. feet, to which 0.42 cub. feet per second of running water must be added, bringing the total available for each irrigation to 1 995 410 cub. ft.

The following data refer to the construction and cost of the reservoirs :

Name of Reservoir	Dam				Reservoir			Cost
	Height	Dimensions at top		Volume	Length	Area	Capacity	
		Breadth	Length					
	ft. in.	ft. in.	ft. in.	cub. ft.	ft.	sq. ft.	cub. ft.	£ s.
Laghi ( 1 lower (1904-05) di Rio	16 4	11 6	210 0	109 400	689	-	494 000	396 10
Grotta ( 2 upper (1907-10)	28 6	16 5	203 5	240 150	853	107 640	1 589 000	793 0
3. Lago del Rio Montempo (1911-12) . . . . .	26 3	13 1	147 7	137 700	722	49 514	742 000	396 10
4. Lago del Rio delle Na- vette (1912-13) . . . .	49 2	19 8	282 2	741 600	1 181	139 932	3 108 000	1 586 0
Totals . . . . .							5 933 000	3 172 0

The price at which the water is sold is valued for all the reservoirs at £2 7s 7d per hour, owing to the considerable increase that has taken place in the growing of irrigated forage crops and of tomatoes. This price could even be raised if the water were to be used at times out of the regular succession and for industrial purposes.

	£	s	d
Considering the net returns at . . . . .	436	2	8
and deducting for interest on capital employed . .	158	11	11
there remains net £	277	10	9

which allows of all the expense being amortized in only 10 years.

- 470 - **Irrigation Experiments in Brandenburg, Germany.** — AUGSTIN Lin Ackerbauwässerungsversuch — *Illustrirte Landwirtschaftliche Zeitung*, Year 33, No 14, pp. 112-113, Berlin, February 15, 1913

A detailed description of the experimental installation of irrigation works in 1911, by the Chamber of Agriculture of the Province of Brandenburg in the exploitation of Jüterbog, the Property of Hr. Bolnstedt-Kaltenhausen. The cost and the profit of the installation are given, as well as the excellent results which have been obtained.

**TILLAGE AND  
METHODS OF  
CULTIVATION**

- 471 - **Field Records relating to Subsoil Water.** — MC GEE, W. C. U S Department of Agriculture, Bureau of Soils, Bulletin 98, pp. 40, Washington, February 1913.

In the semi-arid regions of the United States which have been made productive by the adoption of the dry-farming system, large yields of crops are obtained with an apparently totally insufficient moisture supply in the shape of an annual rainfall of 15 inches; and the present bulletin sets forth the result of an enquiry into how far this insufficient rainfall is supplemented by an underground water supply.

In South Dakota the soils are derived from the underlying clays and shales, and where the latter are exposed in wells, railway cuttings, etc., they are moist almost to the point of saturation, and the moisture increases uniformly with the distance from the surface, suggesting a subterranean rather than a superficial source of supply. The whole district may be looked upon as an artesian area with a catchment area on the Eastern Slopes of the Rocky Mountains, whence the Dakota sandstone conveys the water to South Dakota, the water gradually leaking into and through the overlying clays and shales. The rate of percolation and seepage cannot be accurately stated pending systematic observation, but it has been provisionally estimated at over 12 inches per annum — sufficient to supplement the 15 inches of rainfall and produce an abundant crop.

Another portion of the Region of the Great Plains was studied in South-Western Kansas, and a detailed description of the ground-water condition is given. The conclusion is drawn that the district is underlain by a reservoir of moisture flowing eastward, and derived both from the local rainfall and from catchment on the mountains or higher parts of the plains. The water table occasionally comes to the surface and gives rise to perennial streams and permanent ponds, but though within reach of the surface by capillary movement, it usually lies at an average depth of 30 feet, and may be considerably lowered by excessive use. A provisional estimate was made that 6 to 8 inches of water per annum would rise from the underground supply and be available for plant growth.

It would be difficult to overestimate the importance of these results, for the areas where the subterranean movement and supply of water are indicated coincide with those where dry-farming has been most successful, and it may be inferred that there is a close connection between the two phenomena. Moreover, if this be the case, it will also explain why the system yields such far less satisfactory results when applied to other parts of the world where different geological conditions obtain.

- 472 - **Experiments in Subsoiling at San Antonio.** - HASTINGS, S. H. and LITTELL, C. R.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular 114*, pp. 9-14. Washington, February 1913

Experiments were carried on for three years in a semi-arid region of Texas to estimate the value of subsoiling to the crops. In no instance was the difference in yield significant, nor was the moisture content of the soils increased.

- 473 - **Dry Farming.** - HENDERSON G. S., in *The Agricultural Journal of India*, Vol. VIII, Part 1, pp. 41-46. Pusa, January 1913.

A general survey of the dry-farming conditions in the semi-arid districts of the United States, with a discussion of how far the system might be applied to similar regions in India.

- 474 - **Nitrogen-Enrichment of Soils: Clover as a Manurial Agent.** - SEWITT, F. T. Report of the Dominion Chemist - *Appendix to the Report of the Minister of Agriculture, Experimental Farms, Reports for the Year ended March 31, 1912*, pp. 139-171 (144-146) + fig 1 Ottawa, 1912 (1913)

MANURES  
AND  
MANURING.

This article describes an experiment instituted to determine by direct analysis of the soil the amount of nitrogen that might become part of it through continuous growth of clover, the soil at the outset being a poor one.

The plot set apart for this work was, in the early spring of 1902, dug out to a depth of 8 in., and the excavation filled in with a well-mixed, light, sandy loam; the subsoil was sand. At the outset the plot was dressed with superphosphate at the rate of 400 lbs. and muriate of potash at the rate of 200 lbs. per acre; no nitrogen was given, but the soil was watered with a solution of "nitragin"; lime at the rate of 1 ton per acre was worked into the soil in the spring of 1909, as the plot was showing signs of sourness.

The first seeding of red clover was made in the early spring of 1902 and a very fair catch obtained; the plot has been in clover continuously since that date; the crop was cut as occasion seemed to require throughout the season, the plants not being allowed to go to seed, and the material was allowed to decay on the soil; every second year, the plot was dug over and resown. From time to time, the soil has been sampled and its nitrogen-content determined; the results are tabulated as follows:

*Nitrogen-Enrichment of Soil due to the Growth of Clover*

	Date of Collection	Nitrogen	
		Percentage in Water-free Soil	Lbs. per acre to a depth of 4 in.
Before experiment	13-V-02	0.0437	533
After 2 years	14-V-04	0.0580	708
» 4 »	15-V-06	0.0608	742
» 5 »	30-V-07	0.0689	841
» 6 »	23-V-08	0.0744	908
» 7 »	4-V-09	0.0750	915
» 9 »	5-V-11	0.0824	1005
» 10 »	22-V-12	0.0856	1044
Increase in nitrogen due to 10 years' growth		0.0419	511

During the 10 years of the investigation, the soil gained, simply from the growth of clover, on an average 50 lbs. of nitrogen per annum, or had doubled its nitrogen-content. The value of these data, obtained under conditions considered too unfavourable or disadvantageous for profitable farming, is obvious. The inevitable losses in humus and nitrogen, consequent upon the necessary cultivation of the soil when growing crops other than those which put the land in sod, are also discussed, with a view of emphasizing the necessity for the adoption of a rotation which includes the periodic growth of clovers and grasses.

475 — **The Effect of Sulphate of Ammonia on Phosphatic Manures used for Oats.** — MITSCHERLICH, E. and SIMMERMACHER, W. *Mitteilungen aus dem landw. Institute der Universität Königsberg, Abteilung für Pflanzenbau.* — *Die Landwirtschaftlichen Versuchstationen*, Vols. LXXIX and LXXX, pp. 71-96 + fig. 4. Berlin, 1913.

This article describes experiments on the solubility of bicalcic and tricalcic phosphates on the addition of other salts, and especially of ammonium sulphate (I), and pot-culture experiments with oats (II).

I. — 2 gr. each of bicalcic and of tricalcic phosphate were shaken up for 10½ hours, at a temperature of 30° C., with one litre of distilled water through which a current of carbon dioxide was kept running. The operation was carried out in Mitscherlich's apparatus (Rührapparat). To a certain number of bottles were added at a given time equivalent amounts of various salts, as shown in the following table, which gives the results of the experiments:

Substance employed	Phosphorus pentoxide dissolved	Increase (+) or decrease (—) produced by the addition of the various salts	Relative increase or decrease as compared with the controls
	%	%	%
2 gr. bicalcic phosphate	18.00	—	—
"    "    "    + 10 gr. ammonium sulphate .	29.51	+ 11.51	+ 64
"    "    "    + 8.7 "    "    chloride .	26.51	+ 8.51	+ 47
"    "    "    + 10.76 sodium sulphate. . .	30.68	+ 12.68	+ 70
"    "    "    + 13.02 calcium " (gypsum) . . . . .	13.67	— 4.33	— 24
"    "    "    + 26.16 magnesium sulphate (hydrated). . . . .	28.12	+ 10.42	+ 58
2 gr. tricalcic phosphate	7.16	—	—
"    "    "    + 13.2 " calcium sulphate (gypsum) . . . . .	5.30	— 1.86	— 26
"    "    "    + 10 " ammonium sulphate .	14.44	+ 7.28	+ 102

The amount of phosphorus pentoxide dissolved was only diminished by the action of calcium sulphate; all the other salts increased it, especially ammonium sulphate. It is very probable that this property of increasing the solubility would also be shown, though to a less extent, in manuring experiments, since it has already been found that the application of ammonium salts greatly promotes the assimilation of slightly soluble phosphates. It may therefore be concluded that the use of these salts would increase the yield, when the factor phosphorus pentoxide is present in a relatively minimum proportion.

II.—In the pot-culture experiments, when the other nutritive principles were present in a soluble condition and in sufficient quantities, the addition of about 16 gr. of soluble salts per 6100 gr. of sand per pot, increased the solubility of the phosphorus pentoxide present in the minimum quantity; the minimum of calcium compensated for by the addition of gypsum was 3 gr. in the case of bicalcic phosphate and 1 gr. in that of tricalcic phosphate. The addition of only 0.5 gr. of ammonium sulphate brought about a further increase of the crop and a larger assimilation of phosphorus pentoxide. At the same time, the addition of an excess of ammonium sulphate as compared with the amount used in practical agriculture caused injury to the vegetation.

On the other hand, the addition of sulphate of ammonia after a treatment with superphosphate and basic slag produced no increase in the utilization of phosphoric acid by the oats; and in a loam soil, susceptible to phosphatic treatment, it did not increase the solubility of the phosphoric acid present, nor indeed hinder the degradation of the soluble phosphoric acid given as a manure.

The writers propose, in future experiments, to eliminate the action of nitrogen, as well as the acid chemico-physiological reaction of the salts in question, thereby isolating the solubility phenomena and their effects.

476 — **The Soluble Silicic Acid in Basic Slag and its Influence upon the Determination of Citric-Soluble Phosphoric Acid.** — POPP, M. (Ref.), CONTZEN, J., HOFER, H. and MENTZ, H.: in *Mitteilung der landwirtschaftlichen Versuchs-Stationen*, Vols. LXXIX and LXXX, pp. 229-278, Berlin, 1913.

The writers attribute the difficulties in the analysis of basic slag to a want of an accurate knowledge of its chemical composition. They confirm the belief that the precipitation of the so-called "injurious" silicic acid should be attributed to a deficiency in soluble iron. If, on the contrary, there is a large amount of the latter present, the colloidal silicic acid remains in solution in the alkaline liquid. The precipitation of ferrous sulphide, due to the addition of ferric citrate, can be prevented by a weak oxidizing agent.

The writers therefore propose the following method: to 50 cc. of citric extract should be added 25 cc. of ferric citrate solution, 10 cc. oxygenated water at 0.3%, and 25 cc. of magnesia mixture.

The article contains detailed directions, comparisons with other methods, and in conclusion, deals with the analysis of Wolter phosphate.

477. — **The Value to Plants of Potash Derived from Felspars.** — BIANCKE, E. Arbeit aus dem agrikultur-chemischen Institut der Universität Breslau, *Journal für Landwirtschaft*, Vol. XLII, Part I, pp. 1-10. Berlin, 1913.

Analyses and culture experiments. The writer gives further evidence that mica is a better source of potash than felspars; and concludes that the facility with which the latter decompose, thus supplying potash to plants, is in direct proportion to their potash and soda content.

- 478 — **The Fertilizing Action of Sulphur (1).** — DIMOLON, M. A. in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 156, No. 9, pp. 725-728. Paris, March 3, 1913.

More experiments showing that sulphur is converted into calcium sulphate in the soil, and that the phenomenon is of a biological nature. Further that its fertilizing action is due partly to its effect on the soil bacteria, and partly to the chemical properties of the sulphuric acid which is formed gradually and which not only supplies sulphur to plants but also helps to dissolve mineral elements in the soil.

- 479 — **The Relative Manurial Value of Nile Water and Sewage.** — LUCAS, A.: in *The Cairo Scientific Journal*, Vol. VII, No. 76, pp. 1-9. Giza, Egypt, January 1913.

Sewage in Egypt may be looked upon as Nile water enriched with special plant foods that are deficient in the soil, and therefore in a rainless climate its application to the soil forms an ideal method of disposal.

- 480 — **Manuring Experiments in German East Africa.** — Bericht über die in Deutsch-Ostafrika aus Mitteln des Kali-Propagandafonds im Jahre 1911-12 ausgeführten Düngungsversuche. — *Düngungsversuche in den Deutschen Kolonien* (published by the German Imperial Colonial Office), pp. IV + 71. Berlin, 1913.

A resolution adopted on April 3, 1911, by the German Imperial Parliament provided that a part of the funds voted for the furtherance of the consumption of potash salts should be devoted to manuring experiments in the German colonies. This preliminary report contains the first data collected by the Government agricultural consulting expert of German East Africa.

The question of the use of manures in German East Africa is new, owing to the supposed abundance of nutritive substances in the soil, and to the continuous character of the principal cultivated plants (rubber, palms, coffee, sisal, etc.), considered analogous to that of European forest trees.

It is as erroneous to consider the soils of German East Africa very rich as it is to consider them the reverse. In reality there are both kinds, with a prevalence of medium soils, on which it is not possible to continue for a length of time growing impoverishing crops. Consequently the problem of returning plant food to the soil must be faced.

(1) See No. 234, B. March. 1913.

The following three analyses are characteristic :

	Humus — per cent.	Lime — per cent.	Nitrogen — per cent.	Potash — per cent.	Phosphorus pentoxide — per cent.
Alluvial soil, . . . . .	0.57	8.12	0.10	1.45	0.11
Light gray soil . . . . .	0.06	0.01	0.04	0.20	0.03
Red soil. . . . .	0.10	0.20	0.06	0.30	0.05

It is also to be remembered that the heat and moisture of the tropics favour an active decomposition of the nutritive substances, and that, especially in light soils, these get washed out by the violent tropical rains. Besides, growing annual and perennial plants together leads to an intense impoverishment of the whole soil. Thus, farming based on manuring becomes a necessity, save for the most favoured localities, and as the general use of farmyard manure is impossible, artificials must be resorted to, with the exception of cases in which green manures are used. As for the plan to be followed, an analysis of the soil is no sufficient guide, but experiments in the various estates must be made, considering also the greater cost of manuring under the proposed conditions. It is considered that in order to secure fairly reliable data the experiments must be repeated for five years in an absolutely uniform manner.

In the experiments which were started in 1911-12 on private plantations, and which included : 14 for rubber, 7 for coffee, 1 for cacao, 14 for coconuts, 1 for sisal, 16 for cotton, 10 for maize, 4 for cereals, 6 for potatoes, 3 for lucerne, 7 for pastures, 4 for vegetables and 2 for beans, and at the Government Experiment Stations 3 for cotton and 3 for maize in rotation, the scheme of at least five series of plots, the so-called differential manuring, based on Liebig's law of minima, was followed :

1. Not manured.
2. Phosphoric acid + nitrogen.
3. Phosphoric acid + potash.
4. Nitrogen + potash.
5. Phosphoric acid + potash + nitrogen.

These fertilising elements were applied under the form of chloride of potash containing 56.8 per cent of potash, of double superphosphate containing 40 per cent. of phosphorus pentoxide, and of sulphate of ammonia containing 25 per cent. of ammonia.

A double set of plots in six series may be arranged as follows :

1	3	5	7	9	11	2	4	6	8	10	12
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I. On one line.

1	3	5	7	9	11
8	10	12	2	4	6

## II. On two lines.

Lastly the following doses are recommended:

Crop	Area of plot	Chloride of potash	Double super- phosphate	Sulphate or ammonia
	acre	lbs.	lbs.	lbs.
Cotton . . . . .	$\frac{1}{4}$	33	66	88
Maize and tobacco . . . . .	$\frac{1}{8}$	22	22	14
Cereals and rice . . . . .	$\frac{1}{8}$	16 $\frac{1}{2}$	33	33
Potatoes and beets . . . . .	$\frac{1}{8}$	16 $\frac{1}{2}$	22	14
Beans . . . . .	$\frac{1}{8}$	16 $\frac{1}{2}$	28 $\frac{1}{2}$	23
Vegetables . . . . .	$\frac{1}{40}$	3 $\frac{1}{4}$	4 $\frac{1}{2}$	8 $\frac{3}{4}$
Coffee (1 to 3 years) . . . . .	$\frac{1}{8}$	11	22	22
» (3 years) . . . . .	$\frac{1}{8}$	17 $\frac{1}{2}$	33	33
<i>Manihot Glaziovii</i> (under 2 years) . . . . .	$\frac{1}{8}$	11	22	22
» (2 years old) . . . . .	$\frac{1}{8}$	16 $\frac{1}{2}$	33	33
Kapok (under 3 years) . . . . .	$\frac{3}{8}$	22	14	14
» (3 years old) . . . . .	$\frac{3}{8}$	33	66	66
Coconut and oil palm (under 5 years) . . . . .	$\frac{1}{4}$	15 $\frac{1}{2}$	31	31
» (5 years old) . . . . .	$\frac{1}{4}$	12	44	44
Cacao . . . . .	30 plants	3 $\frac{1}{2}$ oz	5 $\frac{1}{2}$ oz	11 oz
Sisal . . . . .	$\frac{1}{4}$ acre	33 lbs.	44 lbs.	44 lbs.
Fruit trees and vines . . . . .	5 plants	3 $\frac{1}{2}$ oz	3 $\frac{1}{4}$ oz	6 $\frac{1}{2}$ oz
Pasture . . . . .	$\frac{1}{4}$ acre	22 lbs.	22 lbs.	66 lbs.
Clover, lucerne . . . . .	$\frac{1}{8}$ »	15 $\frac{1}{2}$ »	31 »	55 »

The paper reports the results obtained the first year, from which no conclusions can as yet be drawn; the programme of the experiments to be carried out in 1913 is given. The appendix contains further practical instructions for carrying out the experiments and the forms for the tables of results.

- 481 - **Soil Improvement near Rome.** DE ANGELIS D'OSSAT, G : in *Atti della Reale Accademia dei Lincei*, Year CCCX, Vol. XXII, Part 4, pp 246-252. Rome, February 16, 1913.

This is a report upon laboratory experiments conducted with a view to finding the best admixture for «pozzolanella» soils (namely the upper layers of pozzolana), which are frequent in the Roman Campagna. The velocity with which water ascends in these soils, their capacity for water and their rate of drying were determined. The same determinations were made for earthy tufa (often lying under pozzolanella), for marl from the Vatican hill, for mixtures of pozzolanella and tufa, pozzolanella and marl ( $\frac{1}{4}$  by volume) and pozzolanella, tufa and marl. It was found that marl is much more effective than earthy tufa in rendering pozzolanella less permeable to air, cooler and capable of retaining moisture longer. But only field experiments will prove if the admixture of marl applied to pozzolanella soils intended for meadows will be economically advantageous, and if so, to what extent.

- 482 - **Causes affecting the Loss and the Retention of Water Vapour by Plants.** - LECLERC DU SABLON : - in *Revue Générale de Botanique*, Vol. 25, Nos. 290 and 291, pp. 49-83 and 104-122. Paris, February 15 and March 15, 1913.

While authorities have differed greatly as to the degree of importance to be attributed to various factors influencing transpiration, such as light and temperature, the phenomenon has been considered in most cases to be intimately connected with the presence of chlorophyll, and the variations observed in the rate of loss of water vapour under different conditions have been ascribed to purely physical causes. But physical causes are insufficient to explain the results obtained, and some internal physiological causes must be considered as well. Of these the chemical composition of the cell-sap may play some part; but the variations are so small that they could produce but little effect on transpiration, and the author was led to examine with special care the permeability of the cell membranes.

Starting with some preliminary experiments on the transparent leaves of *Elodea*, filaments of *Spirogyra*, and thick sections of ivy leaves, he observed the permeability of the protoplasmic membranes of the cells by means of the penetration of weak solutions of eosine. He found that this varied with the temperature and with the light intensity. This would account for the usual acceleration of the transpiration process in plants exposed to direct sunlight or to high temperatures; but any cause which would tend to contract the protoplasmic membrane, independently of the external conditions, would also render it less permeable and reduce transpiration. This fact was verified 1) by exposing some detached ivy leaves to the rays of the sun for 10 minutes, and 2) by causing them to absorb solutions of high osmotic power and then placing the ends of their stalks in water and comparing them with other leaves whose stalks had been dipping in water all the time. In both cases the subsequent rate of evaporation of the treated leaves was considerably

less than that of the untreated leaves, though all the external conditions for the two sets of leaves remained the same.

Anæsthetics, such as ether and chloroform, also had a preliminary retarding effect on transpiration both in light and in darkness; this was followed by a gradually increasing loss of water vapour, corresponding to the setting up of pathological conditions in the cells by the anæsthetic; as the cells died the membranes lost all power of withholding the water.

The relation between transpiration and the presence of chlorophyll was studied by comparing the green and the colourless leaves of variegated plants under different conditions of light and heat. Leaves placed in sunshine, in diffused daylight, or in higher temperatures, all lost more water vapour than similar leaves in the shade, in darkness, or in lower temperatures respectively, but the ratios of the losses were approximately the same whether chlorophyll was present or not. And though the green leaves showed themselves rather more sensitive than the colourless ones to variations in the external conditions, the fact that all the leaves behaved in the same general way proved that the presence or absence of chlorophyll could not be the controlling factor in transpiration.

Lastly, a study was made of transpiration in succulent plants. In such plants water vapour is emitted only from the peripheral parenchymatous cells lying immediately below the epidermis, and in order to further reduce transpiration the membrane of these cells is almost impermeable, so that variations in temperature and light have a greatly reduced effect.

413 - **The Effect upon Plants of Boron Compounds** (1) - HASSELHORF, E. Mitteilung der Landw. Versuchstation in Kassel (Kreis Kassel). *Die Landwirtschaftlichen Versuchstationen*, Vols. LXXIX and LXXX, pp. 309-320. + tables IV-VII, Berlin, 1911.

A critical review of the literature existing on this subject and of experiments in growing maize and French beans in solutions, and beans and oats in soil.

The writer comes to the following final conclusions:

1. Hotters' observations as to the formation of spots on the leaves as a result of the action of boron are confirmed; these spots occur even with a minimum quantity of boron in the solution in the soil, but no injurious effect upon the yield has been recorded.

2. The injurious effect of boron is clear; the upper limit of boron in solutions is probably 1 mg. per litre; this amount as borax increased the yield of French beans, though it had a bad effect on the appearance of the plants; under the form of boric acid, it had injurious effects on the yield also; larger amounts were decidedly harmful; 1.15 mg. of boron in 1 litre of nutritive solution had also clearly injurious effects on maize.

3. In cultures in soil, 1 mg. of boron in 8 kg. of soil, *i.e.* 0.00001 per cent., had no bad effect upon the beans when applied in the form of borax, although it was injurious in the form of boric acid; in every case larger quantities were harmful. The preceding experiments suggested higher limits.

4. Some experiments, however, seemed to show a favourable influence upon the bulk of the crop, which is to be attributed to the stimulant action of these substances; but the limit for this beneficial action is below 0.00001 per cent. of the soil.

5. Although some experiments have shown that the action of boric acid was more injurious than that of borax, further experiments are necessary to decide whether this was due to the idiosyncrasy of special plants, as in general the effect of the two compounds is equal.

6. The assimilation of boron, whether from solutions or from the soil, usually depends upon the amount present; it appears to be deposited in the stems and not in the grain.

7. Although the exterior effects shown by the spots on the leaves seemed alike in different plants, the action upon the yield was different; perhaps the discrepancies between the results of present and former experiments may be attributed to this fact.

484 - **Solanum Chimeras.** — MARCHAL, E.: in *Annales de Gembloux*, Year 23, No. 3, pp. 121-129. Brussels, March 1, 1913.

Winkler (1) has shown that when reciprocal grafts of nightshade and tomato are cut back to the point of union, composite buds may arise which develop into individuals exhibiting a curious mixture of the characters of the two associated species.

During 1912 the writer repeated Winkler's experiments at Gembloux, proceeding as follows: nightshade (*Solanum nigrum* var *guineense*) and tomato (*Solanum Lycopersicum*) plants were raised from seed sown in January, the plants being hardened off as much as possible before the end of April. The stem of the tomato was then cut 15 to 20 cm. (6 to 8 in.) from the earth level, leaving 4 or 5 leaves on the plant. The stems of the nightshade were cut in the shape of a wedge not less than 3 cm. (1.2 in.) long, and all the leaves were removed. The wedge-shaped stem was then fitted into a corresponding v-shaped cut in the tomato plant, and the two were bound together. After 15 to 20 days the tissues were completely united, and a transverse cut then made about 1 cm. (0.4 in.) from the top of the stock, leaving a rectangular piece of nightshade fused

(1) H. WINKLER: Ueber Propfbastarde und pflanzliche Chimären (*Ber. d. D. Bot. Gesellschaft*, Bd. XXV, H. 10, 1907).

Id.: *Solanum tuberosum*, ein echter Propfbastard zwischen Tomate und Nachtschatten (*Ber. d. D. Bot. Gesellschaft*, Bd. XXVI, H. 8, 1908).

Id.: Weitere Untersuchungen über Propfbastarde (*Zeitschr. f. Botanik*, Bd. I, H. 5, 1909).

Id.: Ueber die Nachkommenschaft der *Solanum* Propfbastarde und die Chromosomenzahlen ihrer Keimzellen (*Zeitschr. f. Botanik*, Bd. II, H. 1, 1909). (Author's note).

into the tomato stem. A large number of adventitious buds were immediately formed round the top of the cut stem, and in almost all cases they presented either pure tomato or pure nightshade characteristics according to their position; but amongst the 30 plants under observation, three cases of chimera were obtained. Where they occurred the other shoots were removed so that the monstrous shoots should benefit by the entire vigour of the plant, and they developed into forms such as have been described by Winkler.

One, belonging to the so-called sectorial type, appeared to consist of the longitudinal fusion of the two species, for on one side of the plant the leaves were all pure tomato, while on the other they were all pure nightshade, and the line of demarcation was sharply defined all down the stem; in the one or two cases where leaves sprang from the point of fusion of the two sides of the stem, these leaves were divided along the mid-rib, on one side reproducing tomato, and on the other nightshade characteristics. At a certain height, the stem split into its two constituent parts which then dissociated completely. The nightshade flowered and fruited profusely, but the organism died before the tomato side had developed any flowers.

On another plant, there arose two buds in such intimate contact that they appeared to spring from a common origin; as the stock was dying a cutting was made of the buds, and later, the two individuals were separated. They both belonged to the periclinal type of chimera, and one of them resembled the *Solanum Kohlreuterianum* of Winkler. In general appearance the plant was very like a tomato, but the leaves were more simple, and the plant was glabrous. It did not, moreover, possess the aroma of the tomato. Flower buds were formed, but did not open, and the luxuriance of the vegetation was marked. The twin bud, as well as a single bud on yet another plant, developed into the *Solanum Gaertnerianum* of Winkler. The leaves were simple, very irregular in shape and surface, almost glabrous, and without the aroma of the tomato. The apices all tended to curve over, causing a kind of twist of the stem, and the intensity of the colour often varied between the depressed and raised portions of the surface. The whole appearance suggested a lack of harmony between the two symbiotes, and this was borne out on the physiological side by a great lack of vitality. No flowering took place, but Winkler obtained flowers and seeds from his specimens and the latter reproduced pure nightshade plants.

Cuttings were made of all these chimeras, and will be submitted to further experiments during the present season.

485 - On Some Vegetative Anomalies of *Trifolium pratense*. - KAJANUS, B. in *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*, Vol. 9, Parts 1 and 2, pp. 111-133 + 8 figs. and 1 plate. Berlin, February 1913.

The writer speaks of the fasciation and yellowing (chlorosis) observed in red clover and finds a connection between these two phenomena.

- 486 - **Self Coloured Violet Seeds of *Pisum arvense*.** — KAJANUS, BIRGLER: in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 5, pp. 153-160, Stuttgart, March 1, 1913.

From a variety of field pea (*Pisum arvense*), whose seeds were grey with violet spots, is derived a variety in which the violet colour is continuous over the whole or part of the integument, or is present in the form of stripes. For the latter variety the writer proposes the name *obscuratum*. The violet colour is due to a pigment dissolved in the cells of the palisade layer. From his cultures and observations (1909-1911) the writer concludes that: 1) the appearance of the violet coloration over the entire integument of the seeds of *P. arvense*, is a modification arising especially in spotted varieties; 2) this modification arises spontaneously, and is not due to any special external influence; 3) the frequency of the occurrence of self-coloured violet seeds can be increased in single plants by the separate sowing of such seeds.

- 487 - **Influence of [Green] Manuring upon Germination of Seeds.** — Report of the Director, 1911-1912, University of Wisconsin Agricultural Experiment Station, pp. 26-27, Madison, Wisconsin, January 1913.

In 1911 a southern student at the Wisconsin Agricultural College reported the failure of some ten acres of cotton to germinate, where it had been sown immediately after ploughing under green clover. On the other hand, on a similar field planted with the same seed, but which had not been green manured, normal germination occurred. Professor Hoffmann has accordingly begun a study of the effect of green manuring upon the germination of seeds subsequently sown. In pot tests in the greenhouse he has incorporated with the soil an amount of green clover corresponding to that applied under field conditions, and has then sown various seeds, in all cases sterilizing one series of pots, while another was allowed to remain in a normal condition.

"It has been found that the decomposition of the clover somehow affects cotton seed, but does not have any material effect on the germination of corn [maize], wheat, and clover. Two experiments conducted with flax have, however, shown a similar detrimental effect to that produced on cotton. The results so far secured indicate that the decomposition of green manures results in the reduction of the oxygen supply and an increase in the carbon dioxide present in the soil atmosphere. It is thought that this change in gaseous content of the soil prevents the germination of the cotton and flax seed, which contain a high percentage of oil, and so require more oxygen for germination than such seeds as corn, clover, and wheat."

- 488 - **Effect of Fertility upon Variation and Correlation in Wheat.** — MYERS, C. H.; in *Proceedings of the American Breeders' Association*, Vol. 7, pp. 61-74, Washington, 1912.

A summary of the results obtained by other experimenters in this subject followed by an account of the writer's own work on a mixed pop-

ulation of Dawson's Golden Chaff. His results indicate that variation is greatest on the poorest soil, but more data must be accumulated before any definite conclusions can be drawn.

- 489 - **Xenia in Wheat.** — BLAIRINGHAM, L. in *Comptes rendus de l'Académie des Sciences*, Vol. 156, No. 10, pp. 802-804 Paris, March 10, 1913.

Cases of xenia were observed in wheat when 1) *Triticum durum* and 2) *Triticum turgidum gentile* were used to pollinate *T. vulgare lutescens*. The hybrids of the second cross exhibited characteristics more accentuated than those of either parents and a hybrid-mutation appeared to have occurred.

- 490 - **Heredity of a Maize Variation.** — COLLINS, G. N.: U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 272, pp. 23, Washington, January 1913.

During the harvest of 1909, a single white ear of corn was observed in a field of Yellow Dent maize at Waco, Texas. From the general circumstances it appeared extremely likely that this might represent a mutation rather than a chance admixture, and the case was further investigated.

The seed from the albinistic ear was sown in 1910; one self-pollinated and two reciprocal cross-pollinated ears were obtained. Beside this, pollen from one of the parents used in the reciprocal cross was taken to pollinate three ears of White Dent, and one of another white-seeded variety named Hopi.

The seeds thus obtained were sown in 1911, the plants were selfed, the resulting ears carefully analysed.

It seems probable that the plant which produced the original albinistic ear received pollen from the surrounding yellow plants, and the first generation therefore represented a cross between white and yellow in which the former was dominant. This is a most unusual occurrence, and the dominance appears completely reversed in subsequent generations. In a general way the progeny of the albinistic ear can be said to have resulted in all shades of yellow with a pronounced tendency to fall into two groups representing 25 per cent. of white and 75 per cent. of yellow. This suggests a single Mendelian character; but the segregation is incomplete, as many of the grains in the recessive class show traces of yellow. On the other hand the numbers do not fit any better under the assumption that two or more Mendelian factors are involved.

- 491 - **The Relation of Certain Ear Characteristics to Yield in Corn [Maize].** — LOVE, H. H.: in *Proceedings of the American Breeders' Association*, Vol. 7, pp. 29-40. Washington, 1912

Studies made on two varieties of corn grown for two seasons. The results show that there exists a slight positive correlation between the length and the breadth of the ear, and the yield of the offspring; but that the number of rows of grain on the ear, and the shape of the ear (cylindrical or tapering) do not have a marked effect on the yield.

- 492 - **The Production of New and Improved Varieties of Timothy.** — WENNER, H. J.: in *Cornell University Agricultural Experiment Station, Bulletin* 813, pp. 339-387. Ithaca, N. Y., 1912.

A full report of the timothy breeding experiments carried out at the Cornell Experimental Station (1).

- 493 - **The Seed-Farm at Schlanstedt, Germany.** — DAMSRAUX A.: in *Annales de Gembloux*, Year 23, No. 8, p. 130. Brussels, March 1, 1913.

An account of the seed-farm belonging to the firm of Strube, including a description of the methods employed for obtaining races of cereals specially adapted to the conditions of North-Eastern Europe, and for improving the Kleinwanzleben sugar beet.

- 494 - **The Improvement of Indian Wheat (2).** — HOWARD, A. and HOWARD, G. L. C. (A paper read at the Punjab Agricultural Conference, Lyallpur, November 4, 1912). *The Agricultural Journal of India*, Vol. VIII, Part. 1, pp. 27-34. Pusa, January 1913.

CEREAL AND  
PULSE CROPS

A discussion of the results obtained by the two main lines of improvement:

1) Agricultural improvements consisting of hot-weather cultivation and dry-farming methods, combined where necessary with green manuring.

2) Improvement in the kinds of wheat grown, by which both quality and yield have been raised.

- 495 - **Svalöf (Golden Barley ("Gullkorn"))** — TEJEN, HANS: in *Sveriges Utställningsutskottets Tidskrift*, Year XXIII, Part I, pp. 27-50. Svalöf, 1913.

Svalöf Golden barley, which appeared on the market this spring for the first time, is a new pedigree variety, which has been selected from an old Swedish barley coming originally from the island of Gotland. It belongs to the *mutans* variety and the grain has the so-called  $\beta$  characters, the rachilla long-haired and the inner pair of nerves of the glume toothed. These characters are not variety characters, but only those of types or groups, but they are of great practical importance, since they in some measure make control easier; for the work of selection they have no direct importance.

The chief object of this Golden barley is to replace Svalöf Haanichen in general farm-practice; it agrees essentially with the Haanichen in several characters of practical importance; thus its stems scarcely reach medium height, and are slender, but strong and rigid; and its ears are relatively thick. The 1000-grain weight, the bushel weight and the time of ripening are also the same as for Haanichen. But Svalöf Golden is easily distinguished in the field from the fact that its ears become dark reddish before ripening and are completely drooping while those of Haanichen are either suberect or nearly horizontal; when

(1) See No. 1514, B, Nov. 1912.

(Ed.).

(2) See No. 357, B, April 1913

(Ed.).

threshed, besides the above-mentioned grain characters Hannchen belonging to the  $\alpha$ -type with a long-haired rachilla and toothless nerves to the glume, the shape of the grain is better in Svalöf Golden, being short and plump, while Hannchen is somewhat elongated.

In the comparative experiments made at Svalöf and at Ulluna in Central Sweden (Branch of the Seed Selection Association) the Golden barley has been tested since 1900. In addition, a number of local experiments have been made in different provinces of Southern and Central Sweden. In these experiments, as in all others carried out at Experiment Stations and on farms, the average grain yield of Svalöf Golden has in every case exceeded that of Hannchen. Though the difference is not particularly large, it is too regular to be the result of chance.

The other varieties tested were also more or less inferior in grain yield to Golden. Princess alone showed itself slightly superior in this respect upon one single occasion (at Alnarp in Schonen).

The straw yield of Golden is the same as that of Hannchen, thus considerably less than, for instance, in Princess and Chevalier.

Golden has the advantage over Hannchen of being less susceptible to smut.

As compared with Hannchen, Golden very soon reaches the state of "after-ripeness" or "germ-ripeness," so that it can be used for maling almost immediately after harvest.

496 - **Data concerning Varieties of Rice.** - CONNER, C. M. in *The Philippine Agricultural Review*, Vol. VI, No. 2, pp. 86-92 + 3 diag. Manila, February 1912.

This is a continuation of the study on varieties of rice of the Philippines (1). Diagrams are given comparing the behaviour of varieties grown in the Philippines with those grown in Indo-China as regards the time required to mature, the yields, the ratio between the dimensions of the grain (expressed by the product of the length by the width, in millimetres) and the number of grains per head or raceme, and between the dimensions of the grains and the yield per acre. The upland and lowland varieties are kept separate.

In one experiment, 279 lowland white varieties grown in Indo-China were compared with a like number of lowland white varieties grown in the Philippines, the tests being made in duplicate at two separate places. It was found that the greatest number of varieties experimented upon mature in six months from sowing. The average yield per acre does not increase with the number of months to maturity: in fact months to maturity bears no relation to yield. The number of varieties with exceedingly small or exceedingly large grains is very limited; also the smallest grains are found in the upland varieties only. Practically all of the upland varieties are non-bearded, while a large percentage of the lowland varieties are bearded, and the smallest grains are found among the non-bearded varieties.

(1) See No. 27, B. Jan. 1913

On grouping the varieties according to size of grains, the number of grains per head is found to be in inverse ratio to the size of the grain. Excepting for the very small and the very large grains the size of the grain has very little influence on the yield.

The greatest number of lowland varieties yield 1400 and 1500 lbs. of palay per acre, while the upland varieties vary within wider limits.

The upland varieties have as a whole longer and wider leaves, and many of them have smooth leaves, while the lowland varieties are catchy (40 per cent. of the upland and 1 per cent. of the lowland have smooth, while the others have rough blades). Practically all the bearded varieties have rough blades. The upland varieties do not stool so freely as the lowland and as a rule have much larger and thicker culms or stalks.

497 - **Possibility of the Development of Rice Growing in Argentina.** - FALDINI José: in *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 11-12, pp. 1311-1350 + figs. Buenos Aires, 1912.

This paper is a report on a journey of study in the State of São Paulo, Brazil. It gives a description of the methods of cultivating rice and of the successive treatment it receives, and of the introduction and development of this crop in Brazil. (In 1910, 2 962 586 bushels of rice were raised in São Paulo. It is also grown in the States of Rio Grande do Sul, Minas, Rio de Janeiro, and others.). The paper mentions also the legislative measures enacted to favour rice growing.

At present in Argentina rice growing is not very important. In 1911 5000 tons of rice were produced in the provinces of Tucumán, Salta and Jujuy, but it would be quite possible to produce besides the quantity required by the country; namely 50,000 tons, a certain quantity for exportation. To attain this object, however, some legislative and administrative measures would be necessary, such as the institution of an experiment station for rice, and the adoption of protective duties.

498 - **The Jack Bean and The Sword Bean.** - PIPER, C. V.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 110 (Miscellaneous Papers)*, pp. 29-30 + plate III. Washington, January 16, 1913.

The jack bean (*canavali ensiformis*) is a native of the West Indies and the adjacent mainland. It has been repeatedly tested in the United States as a forage plant, and the following are some of the results obtained, together with the publications containing the information.

Yield per acre	Publication
30 to 40 bushels beans . . . . .	Mississippi Agric. Exp. Station, Bull. 39, 1896.
35       "       "       " . . . . .	Texas Agric. Exp. Station, Bull. 34, 1895.
40       "       "       " . . . . .	W. Carolina Agric. Exp. Station, Bull. 133, 1896.
16 to 20 tons of green fodder . .	Hawaii Agric. Exp. Station, Bull. 23, 1911.

In the Hawaii experiments, while the crop proved quite drought-resisting it responded well to irrigation.

In Porto Rico the jack bean has been found very useful as a green manure and cover crop in citrus groves. Judging from the behaviour of the plant in trials in Florida, it should prove equally valuable there. It has recently been introduced into Java, where, on account of the large yield of seed, the agricultural authorities were endeavouring to find a market for the product in Europe.

The value of the plant as forage is yet problematical. In experiments made at the Mississippi Agricultural Experiment Station to feed these beans to beef and dairy cattle, they were found to be unpalatable and undigestible.

The sword bean (*Canavalia gladiata*) is found cultivated through much of southern Asia and also in Africa. At various times it has been introduced into America, but is still cultivated almost entirely as a curiosity or as an arbor vine. As forage it is not as desirable as the jack bean, as the foliage is as bitter and the habit inferior.

As a cover crop the Indian variety with red seeds and red flowers has proved very satisfactory in Porto Rico. Cattle are said to graze on the plant there to a limited extent.

In the South of the United States the sword bean is not infrequently seen, but the green pods are not used as a vegetable. Indeed the impression prevails that the seeds are deleterious. Such an idea is erroneous, as the sword bean is largely used as a vegetable in Japan, India, Burma, Ceylon, Java and Mauritius. The pods are best when about half grown. The plant does not mature freely as far north as Washington, D. C., but does produce an abundance of green pods in late September and early October. It seems well worthy of cultivation as a vegetable throughout the Southern States.

FORAGE CROPS.  
MEADOWS  
AND PASTURES

199 — Elephant Grass (*Pennisetum purpureum*): a New Fodder Plant. — STAPP, O.: in *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, No. 7, 1912, pp. 309-316. London, 1912.  
*The Rhodesia Agricultural Journal*, Vol. X, No. 3, p. 368 (note). Salisbury, Rhodesia, February 1913.

In the June number of the Rhodesia Agricultural Journal for 1910, a new fodder grass was described as Zinyamunga or Napier's fodder, and in the autumn of the following year, specimens were sent to Kew for identification and samples were analysed at the Department of Agriculture, Salisbury, Rhodesia.

The grass was identified as *Pennisetum purpureum* Schum. (*P. Benthianii* Steud.), a species of very wide range in Tropical Africa where it is known under a variety of names amongst others as "elephant grass"; but, common as it is, very little is known about its life history and uses; and even its limits as a species and its differentiation into varieties are not settled. Though mentioned as a fodder plant by three other observers from 1905 onwards, it was quite independently of these sources that Mr. E. G. Kenny, Native Commissioner, Gutu, and Colonel Napier, of Springs, Bulawayo, first noticed the grass in the Gutu Di-

strict in 1908, and two years later they published a short account of their experiments with it in the *Rhodesia Agricultural Journal*. They stated that it was a good drought resister, remained green on dry land late into the autumn, and withstood frost to a remarkable degree; further that it was relished by stock and evidently of considerable economic value.

In March 1910 a plot was planted in the Botanical Experimental Station, Salisbury, and tested against sugar cane. A first cutting was obtained in July 1911, and on analysis gave the following results.

	Sugar cane fodder per cent.	Napier's fodder per cent.
Water . . . . .	73.63	61.81
Ether extract . . . . .	22	.20
Protein (Nitrogen $\times 6.25$ ) . .	1.27	2.02
Carbohydrates . . . . .	17.73	17.29
Woody fibre . . . . .	5.32	14.77
Ash . . . . .	1.63	2.02

The Napier fodder contains rather more nitrogen than the cane, but the stalks are far less juicy and the juice is of low sugar content; on the other hand it yields a rich ash, and this may be the meaning of the Gutu natives' statement that they plant it to "make the other plants grow." It is propagated like sugar cane by subdivision of the roots, by cuttings, or freely by slips and roots. Plants established at the Botanical Station in March 1911 were cut to ground level in August in order to provide cuttings for further propagation. The first cutting for forage was obtained in the following February, and subsequent cuttings were taken on March 30, May 30, and June 30. With the two former the growth was about 4 ft. in length, but with the two latter only about  $2\frac{1}{2}$  ft. No rain fell after the end of April, the total for the season being 21 inches. A few weeks after the June cutting, new growth appeared, and the plants remained green, with leaves several inches in length, throughout the whole winter, strong growth commencing again in October. Under similar conditions it is a more rapid grower and provides a greater bulk of succulent feed than sugar cane. Hitherto it has been grown in rows 3 by 2 feet apart and this seems a suitable spacing. Though its main value is undoubtedly as a soiling crop, as a perennial pasture grass it is by no means to be despised, and it can be recommended with confidence for trial on dry land.

500 - **Nonperennial Medicagos: the Agronomic Value and Botanical Relationship of the Species.**—MC KEE, R. and RICKER, P. L. in *United States Department of Agriculture, Bureau of Plant Industry, Bulletin No. 267*, pp. 38. Washington, February 1913.

At present the only non-perennial species of *Medicago* widely distributed in the United States are the spotted and toothed bur clovers (*M. arabica* and *M. hispida denticulata*), and yellow trefoil (*M. lupulina*);

but since 1898 about 60 species and varieties have been introduced for experimental purposes, and an account is given of the progress of the work.

- 501 - **Cultivation Experiments with Leguminous Forage Plants in Argentina.** — TONNELIER, ADOLFO C. *La Soja hispida.* — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 11 13, pp. 1351-1357, Buenos Aires, 1912. — Ensayos con el Cowpea (*Vigna unguiculata*). — *Ibid.*, pp. 1358-1311 + table.

This paper reports upon cultural experiments conducted at the Experiment Station annexed to the "Escuela Nacional de Agricultura y Ganaderia de Cordoba"; it gives data as to the amount of green forage and of seeds obtained with several varieties, as to their analysis and food value. It states the most favourable time for sowing and for harvesting. It shows especially the advantage of obtaining a cut of forage by sowing after reaping a cereal and mowing in the autumn of the same year, that is, as a catch crop.

- 502 - **Keeping Soft Cuttings Alive for Long Periods.** - OLIVER, GEORGE W. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 111* (Miscellaneous Papers), pp. 29-31. Washington, February 1, 1913.

For the transport of soft or herbaceous cuttings, such as those of lucerne and clover, the writer recommends the following method:

Arrange a layer of cuttings without too much crowding, with the upper surfaces of the leaves on a piece of strong glass, and place 2 or 3 inches of living sphagnum moss evenly distributed over the cuttings. Place another layer of cuttings on top of this moss with the under surfaces of the leaves next to the moss, and on top of this second layer of cuttings place a second piece of glass. Press down firmly, and tie together with strong twine. If the moss is kept moist and all the light possible is given, the cuttings are not in the least injured. If the journey is long enough, say four to six weeks, lucerne and many other plants will root freely.

#### FIBRE CROPS

- 503 - **Fibre from Different Pickings of Egyptian Cotton.** — KERNY, THOMAS K. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 110*, (Miscellaneous Papers), pp. 37-39. Washington, January 18, 1913.

Two pickings were made from cotton plants of the Yuma variety at Sacaton, Arizona: the first early in October, the second about a month later. The first picking consisted largely of the bolls borne on the lower fruiting branches of the main stem. The cotton of the two pickings showed the following differences:

	Picked in	
	October	November
Range of variation of length of fibre . .	3/16 inch	2/16 inch
Weight of fibre per 100 seeds . . . . .	4.90 grams	5.17 grams
Weight of 100 seeds . . . . .	129 "	134 "

Further, the fibre picked in November averaged one-sixteenth of an inch longer than that from the first picking; it was also generally stronger and finer.

The lighter weight of the seeds picked in October, and their colour, show that they were not thoroughly mature, and it is not unlikely that these seeds possess a lower percentage of germination.

Similar experiments were made at Bard, California, in 1911 with the same variety of cotton. But the first cotton ripened so early that it was picked in bulk about the middle of September, thus eliminating the cotton from the early opening bolls near the bases of the plants. For this reason the cotton from the two pickings showed less difference at Bard than at Sacaton.

From these experiments it would seem advisable to make the first picking of Egyptian cotton as early as the number of open bolls will warrant the expense of the operation and to keep this fibre as a separate grade and not to mix it with the bulk of the crop which may be expected to show decided superiority in grade and quality. It is also probable that the latest cotton to ripen, especially that contained in bolls which open after a severe frost, should also be graded separately.

504 - **Durango Cotton in the Imperial Valley, California.** — COOK, O. F.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 111* (Miscellaneous Papers), pp. 11-22. Washington, February 1, 1913.

In the regions infested by the cotton boll weevil (*Anthonomus grandis*), the cultivation of the long-stapled cotton is seriously hindered by the fact that this cotton is mostly of late-maturing types, and consequently more severely injured by the parasite. The United States Department of Agriculture has therefore for several years past endeavored to produce an early long-staple cotton. Among others thus produced the three following may be mentioned: Columbia, which was obtained by straight selection from a short-staple variety; Foster, obtained by crossing long and short staple varieties; and Durango by acclimatization and selection of an imported stock from the State of Durango, Mexico, and which belongs to the Upland type. Some long-stapled early cottons had been obtained and gave good results when the weather was favorable to them, but Durango showed greater power of adaptation and gave good yields where other varieties had failed. The Durango plant had an erect bearing; it is early and bears heavily; its bolls are large and they open well; its foliage is light and open. In the Imperial Valley in California, Durango was tested in experimental plantings in comparison with Columbia, Foster, Allen and Egyptian, and proved so much superior to all its competitors that the local cotton-growing community is making an organized effort to place the valley exclusively on a Durango basis.

505 - **Henequen.** — BOURGEOIS, HENRY: in *Annales Diplomatiques et Consulaires*, Vol. IX, Year 12, No. 160, pp. 9-10. Paris, January 1913.

Information respecting the production of Henequen in Mexico and statistical data as to the amount exported, the countries to which it is

sent, and the value of the exports; together with information regarding a tax intended to form a "Defence Fund" for the purpose of hindering the influence exerted on the market by speculators.

506 - **New Zealand Flax (*Phormium tenax*) Refuse. Its Manurial Value.** -

ASTON, B. C.: in *New Zealand Department of Agriculture, Industries and Commerce The Journal of Agriculture*, Vol. IV, No. 1, pp. 16-18. Wellington, January 15, 1913.

It has often been observed that cattle seem to find the leaves of *Phormium tenax* palatable, especially when these are young; it has therefore been suggested to utilize the refuse of the process of extracting the fibre as food for cattle. Others have proposed that if the sodium-sulphite process be used to obtain the fibre, the rejected portion of the leaves could easily be converted into papermaker's pulp. It has also been stated that the ash of the refuse would make a lye to be used for the partial cleansing of the fibre.

At the writer's suggestion experiments were carried out at the Weraroa (Levin), Ruakura (Hamilton), and Moumahaki Experimental Farms with flax waste used as manure. At Levin, on a clay soil resting on gravel, a potato plot dressed with 20 tons of flax waste per acre gave a crop somewhat inferior to that given by 2 cwt. of superphosphate. A 30-ton-dressed plot was very much better, being quite equal to the best of the artificially dressed plots.

At Ruakura the following results were obtained:

	20 tons refuse	10 tons refuse 2 cwt. bonedust 2 cwt. basic slag
Cost of manure* . . . . .	£2 10s	£2 0s 6d
Yield per plot potatoes . . . . .	1 ton	19 cwt.
Yield per acre . . . . .	10 tons	9 tons 10 cwt.
Increase over unmanured, per acre . . . . .	2 tons 7 1/4 cwt.	1 ton 17 1/4 cwt.
Value of increase with potatoes at £4 per ton . .	£9 0s	£7 0s 0d
Profit per acre due to manure . . . . .	£6 10s	£5 8s 6d

\* Allowing 2s 6d per ton for cartage.

At the Moumahaki Farm an experiment was made on a crop of mangels, with the following results:

	2 ½ cwt. Superphosphate 28 cwt. Flax waste	56 cwt. Flax waste
Cost per acre . . . . .	£1 6s 6d	£1 8s
Yield per acre (roots). . . . .	79 tons 1 ½ cwt.	1,5 tons 8 ¾ cwt.
Yield per acre (tops) . . . . .	9 tons 7 ¼ cwt.	1 tons 10 cwt
Increase over unmanured, per acre. . . . .	79 tons 11 ½ cwt	7 tons 6 cwt
Cost per ton of increase . . . . .	4 ½ d	3s 10d

Comparing flax-refuse with stable manure it may be said that while containing similar amounts of water and phosphoric acid, the refuse contains larger amounts of potash and nitrogen.

The refuse in question has given excellent results in fields near the factories, on pastures (as top dressings) and on pumpkins. This manure has a special value for the country, as stock raising in stables is limited and consequently stable manure is rare.

507 - **The Cultivation of Kapok.** — DE WILDFMAN, B.: in *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. V, No. 3, pp. 58-60. Antwerp, March 1913.

The writer records the appearance of a certain number of publications treating of this subject; he calls attention to the fact that the cultivation of *Eriodendron* depends largely on the climate and little on the soil. After giving, from data collected in Java by Mr. G. F. J. Bley, the cultivation expenses of a plantation of 300 bouws (525 acres), M. de Wildeman states that the Dutch consider Kapok cultivation to be only remunerative when practised by the natives.

508 - **Textile Plants.** - *La Quinzaine Coloniale*, Year 17, No. 4, pp. 136-138. Paris, February 25, 1913.

A summary of the different data collected respecting the several varieties of *Hibiscus*. The writer avails himself of a memoir by A. Howard and G. L. C. Howard: Some New Varieties of *Hibiscus cannabinus* L. and *Hibiscus Sabdariffa* L. (*Memoirs of the Department of Agriculture in India, Bot. Series*, Vol. IV, No. 2). He mentions a study of *H. Sabdariffa* by P. J. Webster: Roselle, its Cultivation and Uses (*The Philippine Agricultural Review*, Vol V, No. 3, p. 123: Manila, 1912), and in conclusion, other sources of information respecting Gombo fibre, viz. T. F. Hanausek: Gambohanf (*Real enzyklopädie d. ges. Pharm.*, II edit., 1905, 5,511); v. Hohnel: *Microskopie der technisch verwendeten Faserstoffe* (Wien, II edit. 1905, 56); Matthews: *Textile Fibres* (New York, II edit., 1907, 308); Weisner: *Die Rohstoffe des Pflanzenreiches* (Leipzig, II edit., 1903, 2, 31).

In this recapitulation are given the native names given in India to *H. cannabinus* and *H. Sabdariffa*. Those of the former are: *ambari*, *ambadi*, *pulu*, *mesta pat*, *dare Budrun*, *patson*, *sherka*, *gogu*, *pundi*, *sijado* and *sankukra*, those of the latter are: *mesta patwa*, *bal*, *ambari*, etc.

The Combo hemp, known also under the names of Roselle, Madras hemp and Bimlipatan jute, has lately entered the European markets by way of England. Amongst the varieties of *Hibiscus* must also be mentioned: *H. squamosus*, *H. esculentus* and *H. lunariifolius*; the last, from Northern Nigeria, produces the fibre called «ramma».

## SUGAR CROPS

509 — **The Composition of Beets in the Dry Year 1911 and the Effect of Late Rains upon Them.** — {URBAN, J.: in *Zeitschrift für Zuckerrindustrie in Böhmen*, Year XXVII, Part 6, pp. 303-308 Prague, March 1913

On account of the drought and the heat, the year 1911 was very unfavourable to beets in Bohemia, especially so to those sown at the usual time in spring, which suffered from want of moisture during germination and thence on to September. It was only due to the autumn rains that the crop was enabled to attain from 40 to 60 per cent. of a normal crop.

The writer, availing himself of the weather forecasts of the meteorological stations issued at the beginning of September, which announced the approach of rain, set himself to study the changes that the rain would bring about in the beets. On September 13 he lifted 200 beets in the Station for the production of beet seeds at Větrušic near Prague. Rain began to fall on September 14, and by October 4, 81.7 millimetres had fallen. On this day 150 beets were lifted and analysed as the others had been.

The following table gives the results:

	Before the rain (September 13)	After the rain (October 4)
Average weight of fresh root . . . . . grams	1320	1650
Dry matter in root . . . . . per cent	22.7	20.7
Sugar content . . . . . "	16.82	14.90
Weight of dry matter per root . . . . . grams	300	341
of sugar " " . . . . . "	22.2	24.6
of fresh leaves per plant . . . . . "	1030	1530
Dry matter in leaves . . . . . per cent	16.7	13.9

*Composition of the dry matter.*

	Root		Leaves	
	Before the rain	After the rain	Before the rain	After the rain
	grams	grams	grams	grams
Dry matter. . . . .	30.00	34.10	17.20	21.30
Total nitrogen . . . . .	0.44	0.42	0.56	0.70
Proteid . . . . .	0.23	0.21	0.38	0.51
K <sub>2</sub> O . . . . .	0.29	0.16	0.47	0.44
Na <sub>2</sub> O . . . . .	0.26	0.29	1.82	1.34
Ca O . . . . .	0.08	0.14	0.32	0.42
Mg O. . . . .	0.11	0.12	0.10	0.16
P <sub>2</sub> O <sub>5</sub> . . . . .	0.09	0.08	0.07	0.10
SO <sub>3</sub> . . . . .	0.07	0.08	0.26	0.22

The above analyses show :

1) That the beets gathered before the rain, in spite of their leaves being yellow and wilted, were not mature. A confirmation of this view is found in the high total content of nitrogen (0.335 per cent. of the weight of the fresh root, whilst mature beets contain only 0.14 to 0.2 per cent. according to the soil, on average 0.17 per cent.) and especially of proteid nitrogen ; in the great quantity of alkali in the root with a relatively low amount of lime. In such conditions the extraction of sugar in the factory would have been very difficult.

2) " Even when abundant rain falls later, a wilted beetroot plant cannot immediately absorb nutritive substances from the soil, owing to the want of root hairs ; it first forms new hairs and rapidly builds up the necessary organs of assimilation at the expense of the nutritive substances, especially the potash in the beetroot."

3) " The capacity of the new leaves for forming sugar was limited during the month of September, owing to the prevailing climatic conditions, for only 0.62 grams of sugar were formed daily by 100 grams of the dry matter of the leaves, while in normal summers the daily formation of 1.82 grams of sugar during the month of September has been demonstrated."

4) " In beet plants grown during persistently dry weather considerable quantities of non-proteid nitrogen are stored, a great part of which, during the succeeding rainy period, is transformed into proteid nitrogen. Consequently upon such formation of proteid nitrogen at the

expense of the remaining nitrogen (difference between the total and the proteid nitrogen) and upon the migration of the nutritive substances into the root hairs and eventually into the new leaves, the juice of the root acquires a composition which renders it more favourable to treatment in the sugar factories.

510 - **Experiments made in the Experiment Fields of the Djokja Sub-Section of the Experiment Station of the Java Sugar Industry in 1911.** — VAN DEVENTER, W., HOUTMAN, P. SCHAAT, J. and ECKER, E. E. in *Archief voor de Suiker-industrie in Nederlandsch Indië*, Year XXI, Part 6, pp. 121-172 + 1 plate. February, 1913.

A report of the experiments made in 1911 on the sugar cane at the Djokja Sub-Section of the above-mentioned Station.

The following were the subjects of the experiments: *a*) manuring with various quantities of sulphate of ammonia; *b*) potash manures; *c*) manuring at different seasons; *d*) phosphatic manures; *e*) ashes as manure; *f*) molasses as manure; *g*) scum from sugar factories as manure; *h*) comparison of canes of different origins; *i*) different intervals of planting; *j*) various varieties of canes; *k*) various. The method of experiment is described and analyses of the soil are given.

511 - **Manuring Experiments with Sugar Beets in Hungary.** — PÓLYA, JOZSEF in *Közlönyek*, Year 23, No. 17, p. 573. Budapest, March 1st, 1913.

A long series of experiments made every year at Tavarok (County of Nyitra) on the estate of Baron Stummer.

A. Experiments on three experimental fields of 14.22 acres on moderately heavy clay soil. The previous crop had received stable manure over the whole extent of these three fields and the soil was tilled in the same manner. The following table gives the results and data of the experiment.

Fertilizers per acre	Yield per acre	Excess over control	Gross return per acre	Cost of fertilizers	Net return	Excess of net yield over control
	lbs.	lbs.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
I. Control . . . . .	18 603	—	10-10-10	—	10-10-10	-
II. Superphosphate. 232 lbs.	23 564	4 961	13 7 0	7 5	12-19 7	2-8-9
III. { Superphosphate. 232 "	20 045	7 412	14-15 3	11 5	14 3-10	3-13 0
{ Nitrate of soda . 43 "						

N. B. The value of sugar beets is estimated at 14 68d per cwt. and the cost of the superphosphate and of the nitrate of soda at 4s 3d and 14s 4½ per cwt. respectively.

These experiments show that the sugar beet is extremely responsive to the effect of chemical manures, especially to that of superphosphate and of nitrate of soda.

B. Experiments with fertilizers in drills on three fields each of 14.22 acres.

Fertilizers per acre	Yield per acre	Excess over control	Gross return per acre	Cost of fertilizers	Net return	Excess return over control
	lbs.	lbs.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
I Control . . . . .	16 735	—	10-12-3	—	10-12-3	—
II. Superphosphate 232 lbs., spread . . . . .	22 125	3 390	12-10-8	7-5	12-3-3	1-11-0
III. Superphosphate 116 lbs. in drills . . . . .	22 393	3 658	12-13-9	3-6½	12-10-½	1-17-9½

These figures show that fertilizers drilled in give a larger return than when they are spread.

On the other hand, the crops of barley raised on the same fields, after the sugar beets, showed that the effect of fertilizers in the drills only lasts one year, while if the fertilizer is spread, its efficacy is extended to the second year.

Fields	Yield per acre	Price per 100 lbs. £. s. d.	Value £. s. d.
I . . . . .	1 923 lbs.	6-10	6-11-4 ¾
II . . . . .	2 155 "	—	7-7-3
III . . . . .	1 937 "	—	6-12-5

The writer advises a combination of the two methods of applying manure, in the following manner: the spreading, for instance, of two-thirds of the 232 lbs. of superphosphate and the drilling in of the rest with the seed. In this way, the sugar beets would receive enough nutritive substances and would leave a sufficient amount for the succeeding crop.

C. Experiments were made by growing autumn wheat on three experimental fields each of 21.31 acres (the soil being a moderately stiff clay) to ascertain whether bone meal could rival superphosphate as a fertilizer under the conditions prevailing in Hungary.

The results per acre were as follows:

Fields	Yield
I Control . . . . .	2012 lbs.
II Superphosphate 232 lbs. . . . .	2310 "
III Bone meal 209 lbs. . . . .	2177 "

Taking these results as a basis, the writer considers that, under the given conditions, superphosphate is more to be recommended than bone meal.

512 - **Preliminary Report on Sugar Production from Maize.** - CLARK, C. F.: in *U. S. Department of Agriculture, Bureau of Plant Industry*. Circular No. 111 (Miscellaneous Papers), pp. 3-9. Washington, February 1, 1913.

The experiments were conducted at Garden City, Kansas and at Washington, D. C. The variety used at Garden City was Stowell's Evergreen sweet corn. It was planted on May 15 and the ears were removed on August 9 when in the milk stage. For the Washington experiments a dent corn, a selection of the Boone County White, was used. It was planted about May 30 and the ears were removed on August 22. Tables are given showing the results of the analyses of the corn stalks (from some of which the ears had been removed, while on the others they had been left) gathered on different dates. Experiments were also made on extra pressing the stalks and on the clarification and evaporation of the juices.

In conclusion, the experiments show that the removal of the immature ears from maize stalks greatly increases the sucrose content of the juice. There is also a small increase in non-sugar solids and a very pronounced increase in purity. The percentage of invert sugar is not materially affected.

*Comparison of corn with sorghum and sugar cane as a source of sugar.*

Plant source	Solids	Sucrose	Invert sugar	Non-sugar solids	Purity
	Per cent.	Per cent	Per cent.	Per cent.	Per cent.
<b>Maize:</b>					
Grown at Garden City:					
Ears removed . . . . .	16.37	10.41	—	—	63.81
Ears not removed . . . .	11.51	5.65	—	—	45.13
Grown at Washington, D. C.:					
Ears removed . . . . .	14.21	8.71	2.09	3.31	60.66
Ears not removed . . . .	6.13	3.31	2.13	2.60	36.55
<b>Sorghum</b> (average of 20 analyses, 4 varieties) . . .	14.11	9.11	0.82	4.16	64.46
<b>Sugar cane:</b>					
Louisiana (3 varieties) . .	15.30	12.15	1.35	1.78	79.19
Hawaii (17 varieties) . . .	17.86	15.59	0.43	1.84	87.28

The purity coefficients of the juices are relatively low, the highest being 67.4 per cent. As a sugar-producing plant maize compares very favourably with sorghum in the chemical composition of its juice, but it is much lower than sugar cane in sucrose and purity as will be seen by the table given on the opposite page.

These preliminary studies have been carried out with only two varieties of maize. Other varieties might give more, or less, favourable results. Besides, maize responds to selection for specific purposes, and it is possible that results achieved in the selection of beet might be paralleled with the proper selection of maize.

513 - **A Short Review of the Sugar Industry in the Philippine Islands.** - CONNER, C. M.; in *The Philippine Agricultural Review*, Vol. VI, No. 2, pp. 74-80 + fig. Manila, February 1913.

The cultivation of sugar cane and the art of making sugar were already established in the Philippines when these islands were discovered. From the provinces of Pampanga and Batangas, where sugar making was first carried on, it spread to the other islands.

Sugar cane is grown on every kind of soil, from the light sandy soil of rather low natural fertility of Pampanga to the black, heavy, very retentive clay of Laguna and Batangas, or the volcanic and fertile soils in the neighbourhood of the Taal volcano and the Occidental Negros. In Occidental Negros the average yield of sugar is 2046 lbs. per acre. This average though is lowered by the number of fields poorly managed and of fields of low fertility planted to cane. On well managed plantations the yield per acre will rarely fall below 24 piculs (3389 lbs.), and frequently comes nearer 28 piculs (3925 lbs.). Commercial fertilizers are not used to any extent on sugar cane. Mostly some kind of rotation is followed: in Pampanga and Tarlac rice and corn are planted after the cane crop. In Negros it is the custom to allow the fields to be idle for a year and to pasture the stock on them.

The number of varieties of sugar cane found in the Philippines, prior to the organization of the Bureau of Agriculture, was very limited. The native cane ordinarily grown in Negros is, in respect to the richness and purity of its juice, an excellent cane, and having in addition a comparatively low fibre content it lends itself very well to milling. Many new varieties have been tested during the last twenty years, but only a few have given satisfaction. Some new varieties introduced from Hawaii in 1910 were grown by the Bureau of Science; the following results were obtained at Alabang, province of Rizal:

Analysis of varieties of sugar cane.

Names of varieties	Juice	Polarisation	Brix	Coefficient of purity	Names of varieties	Juice	Polarisation	Brix	Coefficient of purity
	%	%				%	%		
II 16 . . . . .	75.5	14.3	16.3	87.8	II 227. . . . .	75.3	14.1	15.9	86.8
II 20 . . . . .	90.3	18.3	19.3	94.9	II 309 . . . . .	93.2	14.0	17.1	87.6
II 27 . . . . .	77.3	17.0	17.9	95.0	Native cane . .	78.8	19.9	20.7	96.5
II 69 . . . . .	81.5	12.9	15.0	86.0	Negros Cane. . .	89.9	18.1	20.3	90.3

The Hawaiian varieties ripened in Alabang much earlier than in their home. The larger-growing varieties have not met with popular favor among the small planters in the Philippines, first because the stalks were too big for the small mills to handle, and then because the larger varieties would not respond properly to the native methods of cultivation. The native cane is planted in rows varying from 20 to 40 inches apart. Cane is thus planted check the growth of weeds and grasses, but do not produce the greatest amount of sugar per acre. Some of the more progressive farmers are planting the native cane in rows 50 and 70 inches apart.

Until recently the extraction of the sugar was carried out with primitive methods and plant. Lately one large central mill has been erected at Mangarin, Mindoro. It is capable of grinding 1200 tons of cane in twenty-four hours. Two mills of like character are being built, one near Calamba, Laguna, and the other at San Carlos, Occidental Negros.

524 - Varieties of Sugar Cane tried at the Experiment Station of the "Escuela de Arboricultura y Sacarotecnia" at Tucumán, Argentina. — SIMONE, DOMINGO L., in *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 11-12, pp. 1635-1637. Buenos Aires, 1912.

In the five years between 1908 and 1912, 82 varieties of sugar cane were tested at the above station. The varieties Roxa 15, Tamarin 21, Bois Rouge 26, Cayana 48, Verde de las Antillas 50, Sin nombre 52, Sin nombre 58, Sin nombre 65, Riscada de Santa Barbara 74, and 76 Java 234 were distinguished for their sugar content; Cayana Roxa, Verde de las Antillas 50, Sin nombre 52 and 58, and 76 Java 234 for their resistance to *Bacillus sacchari* (polvillo), though no completely resistant variety exists; the same varieties with the exception of Sin nombre 52, for their relative resistance to the attacks of *Diathraea saccharalis* (perforador); the varieties Roxa 15, Tamarin 21, Bois rouge 26, Sin nombre 52 and 58, Riscada de Santa Barbara 74, and 76 Java 234 for their resistance to sudden falls of temperature, which in Tucuman constitute the chief risk in sugar cane growing.

On the whole, 76 Java 234 is, of all the varieties tested, the one most to be recommended. In three analyses of this cane the percentage of saccharose ranged between 11.75 and 15, the purity between 83.33 and 89.82, and the industrial value from 9.79 to 13.47.

515 - **The Extraction and Use of Kukui Oil.** WILCOX, E. V. and THOMPSON, ALICE R. *Hawaii Agricultural Experiment Station, Honolulu, Press Bulletin No. 39, pp. 8. February 6, 1913.*

OIL CROPS.

Kukui (*Aleurites triloba* or *A. moluccana*), is generally distributed throughout Polynesia, Malaysia, Philippines, Society Islands, India, Java, Australia, Ceylon, Borneo, Assam, China, Tahiti and Hawaii. It has been introduced into the West Indies, Brazil, Florida and elsewhere. In Hawaii kukui is common on all the islands, being the dominant native tree of the lower mountain zone. The oil expressed from the kernel of the nut is a drying oil and dries more quickly than any other known oil. It is suitable for use in the manufacture of soft-soap, oil-varnishes, paints, linoleum, etc., for burning, and as a wood-preserved; it is used medicinally as a plaster and as an article of diet.

At one time the exportation of kukui oil from Hawaii amounted to as much as 8 000 to 10 000 gals. per year; the greatest production occurred from 1840 to 1850; at that date the oil was valued at 50 cents per gallon.

The total area of kukui in Hawaii is estimated at from 10 000 to 40 000 acres; 15 000 acres may probably be assumed as a safe estimate. At the rate of 80 trees per acre and 200 lbs. of nuts per tree, there would be a yield of 8 tons of nuts per acre. A conservative estimate would be 5 tons of nuts. If we assume that not more than 10 000 acres of the area of kukui are readily accessible, the yield would be 50 000 tons, which would produce 2 375 000 gallons of oil.

According to laboratory experiments of the writer it would require 210 tons of nuts to produce 10 000 gals. of oil weighing 7.36 lbs. per gallon.

The kukui is practically free from serious insect pests or fungous diseases, and bears an annual crop of nuts without fail. From the writer's experiments it appears easy for a man, woman or child to pick up 500 lbs. of nuts per day. At 30 cents per 100 lbs., the labourer would receive \$1.50 for a day's work. The kernel equals 30 per cent. of the weight of the nut; the average oil content is 65 per cent. of the kernel, or about 19.5 per cent. of the nut. In the Sunda Isles, where kukui oil is an important article of export, experiments have shown that 90 per cent. of the oil, equalling 17.5 per cent. of the weight of the nuts, is obtained by commercial methods through the use of presses. From 100 lbs. of nuts 17.5 lbs. of oil would be obtained, or a value of \$1.75 at 10 cents per lb. Only an extremely small percentage of the nuts spoil or turn rancid even after lying two years on the ground. The spoiled nuts float in water and may thus be easily separated from the sound ones.

Kukui oil may be obtained by grinding the kernels and applying pressure with or without previous roasting of the nuts.

*Chemistry of kukui oil.*

Specific gravity . . . . .	0.92 at 15.5° C
Saponification value . . . . .	179.1
Iodine number . . . . .	155.5
Hofmeister value . . . . .	89.9
Soluble acids . . . . .	1.71
Reichert-Meissl number . . . . .	2.82

*Constituents of the kukui kernel.*

	Fresh nuts
Moisture . . . . .	7.14 %
Fat . . . . .	66.25 %
Ash . . . . .	3.05 %
Protein . . . . .	19.88 %
Fibre . . . . .	1.39 %
Nitrogen-free extract (by difference) . . . . .	2.29 %

The press-cake is unusually rich in nitrogen (46 to 48 per cent. of protein), phosphoric acid (about 4 per cent.  $P_2O_5$ ) and potash (1.5 to 2 per cent.  $K_2O$ ). It therefore has a high value as a fertilizer, but it cannot be used as fodder as it has a poisonous effect upon stock.<sup>17</sup>

**516 - *Canarium polyphyllum*: a New Oil Fruit from German New Guinea.** -

KRAUSE, M.: in *Der Tropenpflanzer*, Year 17, No. 3, pp. 147-150. Berlin, March 1913.

*Canarium polyphyllum* (Burseraceae) is frequent all over New Guinea. In the islands of the Malay archipelago there are several species of *Canarium* from which is obtained the oil known in trade as «Kauriaöl», «Javamandelöl», «Huile de Canaria», «Java almond oil» and «Jungle badam» (Hindostan).

In size and shape the fruit of *C. polyphyllum* resembles a walnut.

The writer extracted, by means of ether, the fat from fruits received from German New Guinea, and obtained the following results:

*Canarium polyphyllum*

Weight of 10 nuts with their woody shell . . . . .	93 grams
Weight of 10 kernels . . . . .	21 "
Fat in kernels, per cent. . . . .	68.23
Nitrogen in residue after extraction with ether, per cent. . . . .	9.77
Equivalent to protein . . . . .	61.06
Values of the fat:	
Solidifying point . . . . .	19 to 20° C.
Melting point . . . . .	30° C.
Refractive index at 21° C. . . . .	1.475
Acid value . . . . .	225
Saponification value (Koettstorfer) . . . . .	200.2
Iodine value . . . . .	59.74
Reichert-Meissl value . . . . .	4.41

Feeding experiments have shown that neither the kernels nor the press-cake of *C. polyphyllum* contain injurious substances; and the fruit is eaten by the natives of New Guinea. The press-cake is rich in proteins and is thus a concentrated food. The fat has no unpleasant flavour and can be used for the preparation of margarine and the like.

517 - **Cuttings or Stumps for planting Hevea** (1). — WEBER, A. J. C. Plançons contre Stumps. — *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. V, No. 3, pp. 49-50, Antwerp, March 1913.

RUBBER,  
GUM AND RESIN  
PLANTS

The writer discusses the advantages and disadvantages of the two methods of making Hevea plantations: by cuttings or by stumps. The first is the more costly, but M. Weber thinks it has so many advantages, that he prefers it to the stump method. He recommends the germinated seeds being planted in a nursery about 2 ft. by 2 ft. apart.

518 - **Iquitos, and the Tributary Region. The Rubber District of the Amazon.** — *Peru To-Day*, Vol. IV, No. 10, pp. 537-546. Lima, January 1913.

The article under review is an abstract of a report of Mr. Stuart J. Fuller, American Consul at Iquitos, who has made a joint investigation of the Putumayo region with Mr. G. B. Mitchell, the British Consul, and Mr. Carlos Rey de Castro, the Peruvian Consul at Manaus, Brazil.

Iquitos is the capital and principal town of the Department of Loreto, which includes most of Trans-Andean Peru and has an estimated total area of 288 500 square miles. The climate is warm and moist, the average temperature being from 80 to 88° F. Rains are frequent and abundant, aggregating 60 to 75 in. in a year. A vast region of tropical forests, traversed by the Caqueta (Yapura), Putumayo (Ica), Napo, Marañon, Tigre, Pastaza, Morona, Santiago, Javary, Ucayali, and Kuallaga river systems, all affluents of the Upper Amazon, is commercially tributary to Iquitos. As may be seen from the following table, almost the only product of the district is rubber; all supplies are imported.

*Exports from Iquitos in 1911.*

Rubber: Fine . . . . .	1 481 037 lbs.
Intrefine . . . . .	205 947 "
Scrappy . . . . .	595 936 "
Slab . . . . .	85 462 "
Peruvian ball . . . . .	1 472 802 "
Weak fine and tails . . . . .	748 500 "
Hides . . . . .	43 623 "
Vegetable ivory («tagua») . . . . .	991 165 "
Panama hats . . . . .	117 dozen
Raw cotton . . . . .	286 lbs.

The export of rubber for the first six months of 1912 reached a total of 2 975 355 lbs., and that of vegetable ivory for the same period 1 430 450 lbs.

There are a large number of *Phytelephas macrocarpa* palms growing wild in the forests of the territory tributary to Iquitos. The trade in the nuts of this palm (vegetable ivory, also known as «tagua», «marfil végétal» and «corozo nut») is developing. Trade in cinchona, salsaparilla and other drugs has entirely ceased. Valuable woods are to be found in the forests, but there is no trade in them owing to failure in transportation facilities. Experiments are being tried on a small scale in the cultivation of cotton, coffee and cacao, but these are as yet of no commercial importance.

The rubber produced in the district of Iquitos is classified as «jebe» and «caucho». «Jebe» is divided into lowland — fine (smoked), entre-fine (smoked), scrappy (not smoked), and highland — weak fine (smoked), and weak scrappy (not smoked). «Jebe» is obtained from *Hevea brasiliensis*, trees which grow close enough together to enable the worker to handle a group of one hundred trees, called an «estrada» (walk) a day, visiting and tapping them. One man can manage two «estradas» on alternate days. The quality of the jebe varies according to soil and method of preparation. If grown on land high enough not to be flooded, it is weak, though it may be fine — i. e., it has a fine texture but breaks at a lower strain than that grown on periodically submerged land, which is known as fine without the qualification of weak. Entre-fine is lowland rubber, but not so well prepared as the fine. Sernamby or scrappy is from milk which has coagulated without being smoked, and is more brittle.

«Caucho» comes from *Ficus elastica*, which grows scattered and solitary in the forest, usually on the higher land and at some distance from the rivers. The tree is not tapped but is cut down, and the sap runs out to form a pool in a hollow in the ground or in a bowl or basin. Little caucho is left on the rivers to the northward of Iquitos. Ball, or «sernamby de caucho», is caucho that has been coagulated without any treatment, and then cut into strips and the strips wound into balls. Slab is caucho coagulated without smoking by a special process which involves mixing it with a kind of green liana, soap or other diluents.

From the Javary River district comes fine, weak fine, weak scrappy and ball rubber. The caucho is fairly well worked out there; the same applies in the Napo and Tigre, which were once great sources for ball, though a good deal of caucho is still available in the Ecuadorian reaches of the Napo. The rubber from the Putumayo district is called Putumayo «tails». It is prepared in a different way from that on the other rivers. Not much rubber comes in directly from the Marañon, but what is found there includes all the grades of caucho and the weak varieties of jebe.

The export duty on rubber is fixed at 8 per cent. *ad valorem* calculated on the selling price at Liverpool.

It is generally felt that the quality of Peruvian rubber is so good that it can hold its own against the production of other regions, parti-

cularly cultivated rubber. The methods of extraction are fairly good, but there is room for improvement in the elimination of impurities.

All the Amazon rubber must be washed before it is used in the processes of manufacture, Peruvian fine losing 12 to 20 per cent. and scrappy 25 to 50 per cent. on account of their moisture content.

519 - **Tobacco in Great Britain and Ireland.** -- ELLIS, R. British-grown Tobacco. *The Journal of the Board of Agriculture*, Vol. LXIX, No. 11, pp. 904-908. London, February 1913.

VARIOUS  
CROPS

Tobacco growing in Ireland may be said to have passed its experimental stage; the commercial possibilities of the crop are proved, and though Irish tobacco is subject to the same excise duties as imported tobacco, the present growers are in receipt of a subsidy for a determinate period. The official returns show that 61 881 lbs. were produced in 1911, and the price obtained on the market was from 4d to 7d per lb.

In England, Scotland, and Wales, home-grown tobacco is subject to the same excise duty, but the Finance Act of 1910 provided for a rebate of one-third of the duty of 3s 6d, i. e. 1s 2d, per lb. upon 100 acres in England and Wales, and 50 acres in Scotland to be grown during the years 1911-12-13. In 1911 approximately 1000 lbs. of tobacco were grown and cured in Scotland, and 300 or 400 lbs. in different parts of England. During 1912 about 40 acres were under tobacco in Great Britain; taking an average yield of cured tobacco at 1 100 lbs. per acre, the estimated weight of the crop may be taken at 44 000 lbs.

This being the first English crop of any commercial importance, considerable interest is being evinced as to results; so far the crop appears to have come through well, and the quality shown in the final process of grading and rehandling preparatory to packing, seems to be of a satisfactory order. The tobacco is still in the growers' hands, and so far but little has been sold excepting the Welsh crop, which has been disposed of at a satisfactory figure.

520 - **The Data obtained in 1911 respecting the Use of the Products of Crosses of Heavy-Leaved Species of Tobacco Resistant to *Thielavia basicola*.** -- ARIZELLI-DONNARUMMA. *Ministero delle Finanze, Direzione Generale delle Finanze, Bollettino tecnico della Coltivazione del tabacco pubblicato per cura del R. Istituto Sperimentale in Scalfati (Salerno)*, Year XI, No. 6, p. 260 + 1 table. Scalfati, 1912.

This is a general review of the industrial results obtained by cultivating coarse-leaved hybrid tobaccos resistant to *Thielavia basicola*. Some of these crosses unite agricultural and industrial advantages, which make them preferable to the Kentucky variety. The "Agenzia dei Tabacchi" is going to institute the cultivation, on a large industrial scale, of Italia X Kentucky and Salento X Kentucky.

521 - **Production and Consumption of Cocoa.** — FERROT, E.: in *Voordrachten over Koloniale Onderwerpen gehouden ter Gelezenheid van de Koloniale Landbouwtentoonstelling te Deventer*, pp. 167-182. Deventer, January 1913.

The writer gives a complete account of the cocoa industry, including its history, a description of the different species and varieties of cocoa plants, details of cultivation and of the various processes of fermentation, washing, and drying which the kernels undergo before being ready for the market; and then he passes on to consider the production and consumption of cocoa in the world.

Up to 1870, the producing area was restricted to Central America, Brazil, Mexico, and the Antilles; but cultivation trials were beginning in the Island of San Thomé, which after 40 years was to become one of the great centres of production. More remarkable still has been the growth of the industry in the Gold Coast, for here as late as 1899 the production was nil. At the present time the exports are as follows.

*America :*

	Tons.
Brazil . . . . .	33 180
Ecuador . . . . .	30 150
Trinidad . . . . .	22 881
Venezuela . . . . .	16 615
San Domingo . . . . .	14 578
Grenada . . . . .	6 256
Others . . . . .	11 362

135 022

*Africa :*

Gold Coast . . . . .	22 104
San Thomé . . . . .	29 137
Fernando Po . . . . .	2 626
German Colonies . . . . .	3 345
Belgian Congo . . . . .	689

57 901

*Asia :*

Ceylon . . . . .	3 472
Dutch Indies . . . . .	2 410

5 882

Africa is rapidly taking the place of America as the chief cocoa producing area of the world, and it is interesting to examine the average yields obtained in the two regions. In Africa  $3\frac{1}{2}$  to  $4\frac{1}{2}$  lbs. is obtained from a single tree, and very frequently the figures are even higher, whereas in America, for no apparent reason, the average yield is only  $2\frac{1}{2}$  lbs. The larger African crops are obtained both when cocoa is cultivated on large estates, as in San Thomé, Fernando Po, and Kamerun, and also when it is in the hands of the small native cultivators, as in the Gold Coast.

Whilst the African production has been increasing with astonishing rapidity, the total consumption has advanced in a no less remarkable manner; figures for 1894 and 1910 are given below.

	1894	1910
United States . . . . .	7 806	19 190
Germany . . . . .	8 184	11 274
England . . . . .	9 769	23 667
France . . . . .	14 629	24 661
Holland . . . . .	9 499	15 926
Switzerland . . . . .	2 081	8 853
Italy . . . . .	639	1 859
Spain . . . . .	6 616	5 430
	59 243	173 130

In 16 years the consumption has trebled itself, but it is evident that this increase cannot go beyond certain limits; as the culture is spreading in all the West Coast of Africa, these limits will probably be reached in the course of a few years, after which time only those regions which are naturally best situated to the cultivation of the plant will continue to yield profitable returns.

323<sup>7</sup>- **Horticulture in 1913.**- PASSY, PIERRE: *La Vie Agricole et Rurale*, Year 2, No. 13, pp. 349-353. Paris, March 1, 1913.

MARKET  
GARDENING

The writer passes the following subjects quickly in review: climatic conditions; horticultural shows; economic questions; exportation to America; the importance of bulb growing in Holland; the effect upon plants of tarring the roads; plant diseases (plomb and chlorosis); chemical fertilizers (sulphur and manganese); horticultural methods (Lorette pruning system); asexual hybridization and xenia; horticultural novelties (roses, other flowers, vegetables); the instruction of girls in horticulture (a school established at the Ecole Nationale et Grignon).

323<sup>8</sup>- **Winter Pruning of Stocks Preparatory to Grafting on the Spot.**- VIDAL, J. L.: in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1006, pp. 429-433. Paris, March 27, 1913.

FRUIT-GROWING

On the approach of spring, part of the reserve products which were accumulated in the autumn in the roots of the vine ascend and migrate towards the shoots; thus it is easy to understand that those vines from which the shoots have been removed in December will be better supplied with carbohydrates in the spring than the unpruned plants. As far as grafting is concerned, the larger the supply of reserve-material the more numerous the grafts which take and the better do these do. The comparative analyses of three young 1202 vines made in May 1911 gave the following results:

	Weight % of fresh material	Carbohydrates per 100 parts dry material	Carbohydrates per 100 parts fresh material	Date of cutting
Plant not cut back	34.5	23.01	8.14	May 23, 1911
Plant cut back in April 1911	38.7	26.90	10.32	May 23, 1911
Plant cut back early in January 1911	41.2	28.00	11.53	May 15, 1911

Thus the uncut vine is much the poorest in reserve substances at the time of grafting, while that cut back in January is the richest of the three. The logical deduction therefore is that it is advantageous to reduce to the minimum, from December, the shoots of stocks destined for grafting on the spot in the following spring. Practical experience has confirmed the theoretical conclusions, and the writer deduces from his experiments in the open that the following advantages result from the winter pruning of stocks to be grafted on the spot:

- 1) The increased vigour of the grafts which have taken, very noticeable when the buds are breaking, but always perceptible throughout the vegetative period.
- 2) More complete binding, due to the greatly increased activity of the tissues of the stock, subsequent to grafting.
- 3) Higher proportion of successful grafts.
- 4) Much lower proportion of mortality among the stocks in the case of unsuccessful grafts. More vigorous sprouting of the stocks, allowing more certain and satisfactory re-grafting of failures in the following season.

The grafting technique is very simple; it is only necessary to suppress the shoots by cutting them at the lowest eye. The essential point is that the pruning should be effected as far as possible between the 15th of December and the 15th of January. The most careful vine-growers will derive the most profit from this preparation of the stocks, for as a rule their vines are the most luxuriant and the good effects of cutting back are in direct proportion to the strength of the stocks.

524 - **Variation of Yield of Grafted Vines with Age.** - RAVAZ, L.: in *Le Progrès agricole et viticole*, Year 30, No. 9, pp. 257-262. Montpellier, March 2, 1913.

M. Ravaz, in commenting upon the two tables giving the production for 28 consecutive years of vines now 33 years of age (experiment field at Mas le Las Sorres, near Montpellier), writes as follows:

"The deterioration of the grafted vine, when it occurs, is not due to grafting, nor is it generally to be attributed to age. It is the result either of phylloxera, in the case of all non-resistant varieties, or of the unsatisfactory conditions of the soil or subsoil; in deep, good soil, the life of the vine is, so to say, indefinitely long; but in poor or very calcareous soil, or where the subsoil is too clayey, or too wet and impermeable, the vines soon begin to fail, after having done well for a shorter or longer time, no doubt as long as most of the roots were in the good superficial soil."

- 525 - **Vineyard Reconstitution and New Stocks.** - CERVAIS, P.: in *La Vie Agricole et Rurale*, Year 2, No. 14, pp. 386-391. Paris, March 8, 1913.

In this report presented to the "Société des Viticulteurs de France" (general meeting of February 1913), the writer specifies the principles of vineyard reconstitution which are now considered as established and as forming the essential basis of modern vine growing.

He then proceeds to lay great stress upon the importance, in the light of experience, of preserving such of the old stocks as merit retention, having entirely fulfilled their early promise, and those new-comers which deserve, or appear to deserve, a place among the older ones.

- 526 - **On the "Localization" of Direct Bearers.** - ROY-CHEVRIER, J.: in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1001, pp. 209-271. Paris, February 20, 1913.

According to the writer, the success of direct producers chiefly depends upon their "localization", i. e. the judicious and wise selection of stocks which are themselves suited in all essential respects to the special climatic and cultural conditions of a given district.

- 527 - **Imbedding Whip-Grafts of Vines in a Hot Chamber.** - CHAPPAZ, G.: in *Le Progrès Agricole et Viticole*, Year 34, No. 12, pp. 356-360. Montpellier, March 23, 1913.

The writer gives a detailed description of the method of imbedding whip-grafts in a hot chamber, which practice obtains more and more on all vine-farms where a sufficiently warm spring cannot be relied upon. According to this system, the grafts are put into open cases filled with a material as loose as possible and which can retain a certain amount of moisture; these cases are placed in a room with a temperature of 30° or 35° C. (86 to 95° F.) for the time required for them to bind properly. The substance generally used in the cases is a mixture of poplar sawdust and charcoal dust; the former retains the moisture and the latter allows the excess of water to drain off, while it hinders fermentation and the growth of moulds.

- 528 - **Reconstitution of the Vineyards in the South of France.** - MARÉS, IS.: in *Le Progrès Agricole et Viticole*, Year 30, No. 10, pp. 205-209. Montpellier, March 9, 1913.

Seeing the present high price of vines, whether grafted or on their own roots, the writer advises for the reconstitution of vineyards, methods which, though now somewhat out of date, proved very satisfactory when applied by him to a vineyard of some 60 acres.

The first of these methods consists in planting cuttings in the open and in such numbers (4800 per acre) that gaps can be replaced by the superfluous cuttings, and then proceeding to plant another area of the same size (placing the cuttings 5ft. 3in. apart each way, which will give 1600 per acre).

The second method consists of making a nursery, where the percentage of successful grafts is from 80 to 90; while the third consists of planting rooted stocks "in holes in winter" and grafting 5 or 6 months after.

529 -- **Vine Growing in the Province of Mendoza, Argentina.** — RODRIGUEZ, FRANCISCO J. and LAHTI, EMILIO: in *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 17-12. Buenos Aires, 1912.

The totals are here given, for the whole province of Mendoza, of some of a series of tables containing the data for every district of the province :

*Cost of an acre of vineyard 3 years old.*

When the work is done by contract, . . . . .	£ 83
When managed by the owner . . . . .	£ 55

*Extent of vineyards.*

Vineyards planted with French vines . . . . .	110 982 acres
Vineyards planted with native (criollo) vines . . . . .	21 288 "

*Irrigated area in the province of Mendoza in 1912.*

Already irrigated. . . . .	721 448 acres
To be eventually irrigated . . . . .	732 884 "

*Grape production of 1912.*

	Quantity
White . . . . .	15 123 627 lbs
Black . . . . .	976 474 045 "
" Criolla " . . . . .	100 647 533 "
	Value
Total . . . . .	£4 245 850

*Grapes exported in 1912 :*

White . . . . .	140 755 lbs
Black . . . . .	4 760 214 "
" Criolla " . . . . .	3 776 870 "

*Wine production of 1912 :*

	Quantity
White . . . . .	1 027 211 gals
Red . . . . .	69 273 826 "
" Criollo " . . . . .	5 639 007 "
	Value
Total . . . . .	£7 854 749

*Chemicals used in the making of wine and their value.*

Tartaric acid	2 233 594 lbs	worth	£153 872
Citric "	261 483 "	"	" 23 000
Tannin	51 188 "	"	" 5 097
Enophosphate	440 671 "	"	" 9 453
Metabisulphite	91 145 "	"	" 3 227
Clarifiers	9 938 "	"	" 226

530 - The Use of Chemical Manures for Fruit Trees. Results of Experiments made in 1909 and 1910 by the Royal Agricultural Station of Magyaróvár, Hungary. — SURÁNYI, JÁNOS: in *Kisérletiügyi Közlemények*, Vol. XVI, No. 1, pp. 61-73. Budapest, January-February 1913.

In 1909, the Royal Agricultural Experiment Station of Magyaróvár made experiments in different parts of Hungary on the use of chemical manures for fruit trees; the effect of the treatment was also noted in the following year.

The results obtained were as follows:

1) Under the continental type of climate prevailing in Hungary, the use of chemical manures increases the productivity of fruit trees. This is of especial importance for the trees on the vast sandy stretches of Hungary, where the poverty of the soil only allows a crop every other year.

2) Although the returns of one year show that the use of chemical manures is remunerative, it is impossible to determine the actual profit obtained till after at least two normal years.

3) This manuring not only increases the quantity, but also the quality of the fruit.

The following table shows the increase in the yield of 100 fruit trees obtained by the station in 1 and 2 years respectively:

Districts		Apples	Pears	Plums	Apricots	Green-gages	Egriots	Quinces	Cherries
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
In 2 years	Baja . . . . .	—	287	408	1 530	1 250	—	855	—
	Nagykorösi . . . . .	13 350	2 850	—	—	—	—	—	—
	Erőműhelyfalva . . . . .	275	600	970	—	—	—	—	—
In 1 year	Püspökhalás . . . . .	1 450	8 800	3 300	5 850	—	5 850	—	8 800
	Alsóvály . . . . .	1 250	—	—	—	—	—	—	—
	Perecsen . . . . .	4 400	4 550	—	1 100	—	—	—	—
	Felsővály . . . . .	7 575	14 900	730	—	—	—	—	—

531 - Data on the Cultivation of Citrus Fruit in the Province of Salerno, Italy. — BRIGANTI, G.: in *Italia agricola, Giornale di Agricoltura*, Year 4, No. 6, pp. 152-153. Piacenza, March 30, 1913.

The citrus fruit plantations in the province of Salerno occupy an area of 4589 acres, without reckoning trees mixed with other crops. The yearly production of fruit is 492 000 cwt., of which 275 500 cwt. are oranges, 157 440 cwt. lemons, and 59 000 cwt. tangerines; the total value is about £198 000. The lemons grown along the coast of Amalfi are a forced cultivation; the preparation of the land costs from £320 to

£ 800 per acre. In the Nocera district the best citrus fruit groves are let at rents reaching to £ 32 per acre; they generally consist of oranges and tangerines planted in alternate rows (about 240 trees per acre), and they are often interplanted with walnuts (32 to 40 per acre). The harvest continues from December to August. The oranges most grown are the flattened orange (*Citrus Aurantium depressum* Risso), the pear-shaped orange (*C. A. ellipticum* Risso), the Maltese, and the blood orange. Almost all the lemons are exported to New York and to England; two thirds of the oranges and tangerines produced are consumed in Italy; the rest are exported, chiefly to Austria-Hungary. The price of tangerines ranges from 6 to 12 shillings per cwt., that of oranges from 2s 10d to 4s per cwt. from December to March and from 7s 3d or 8s to 12s and 16s per cwt. in summer.

532 - **Citrus Fruit Growing as a Commercial Industry in Southern Rhodesia (1).**

— FARMER, C. E.: in *The Rhodesia Agricultural Journal*, Vol. X, No. 3, pp. 358-361. Salisbury, Rhodesia, February 1913.

The writer of the above is adviser on citrus cultivation to the British South Africa Company; he gives a most encouraging account of the prospects of this new industry. Having had 18 years' experience in America, he considers that 5-year-old orange trees in Southern Rhodesia surpass 7-year-old trees in Florida both in size and in bearing capacity, notwithstanding the fact that the latter receive two dressings of fertilizers every year while the former remain unmanured.

533 - **The Peach in the South-East of France.** TSCHAEN, E.: in *Journal d'Agriculture pratique*, Year 77 (1913), Vol. I, No. 12, pp. 366-369. Paris, March 20, 1913.

On light and calcareous soils, the peach does well on its own roots; but when the soil is a clay and damp, it is grafted on the plum, and in the case of dry soils, on the almond.

The writer enumerates the varieties of peaches grown in the South: a) soft peaches: Ausden, Alexander, Halle Early, Earliest of All, Vainqueur; b) hard or Pavie peaches: Yellow Madeleine, White Pavie, Yellow Brunet Pavie, Yellow Saint-Michel Pavie. He then deals successively with the height and shape to be preferred for the trees, winter pruning, picking and yield, diseases and insect pests.

534 - **Bartlett Pear Precooling and Storage Investigations in the Rogue River Valley.** - STUBENRAUCH, A. V. and RAMSEY, H. J.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 114*, pp. 19-24. Washington, February 1913.

As the result of a one season's experiment in Oregon, it was found that if picked when fully ripe, carefully handled, and cooled without delay, Bartlett pears may be stored for four weeks at the shipping point, and being subsequently sent in refrigerated cars to the Eastern markets will arrive in a sound marketable condition.

535 - **The Reine-Claude Green Gage.** — RABATIN, R.: in *Le progrès agricole et viticole*, Year 30, Nos. 10 and 12, pp. 311-315 and 365-378. Montpellier, March 9 and 23, 1913.

After a few words concerning the fruit and production of this plum tree, the writer deals at length with the method of pruning the Reine-Claude variety and concludes as follows:

While the shaping of the tree is a rather difficult and lengthy task, the further pruning is simple and easy and very favourable to the production of fine market fruit.

536 - **The Cultivation of the Japanese Medlar.** — OINOU, J.: in *Revue Horticole*, Year 85, No. 5, pp. 106-107, 3 figs. Paris, March 1, 1913.

The Japanese medlar is a low tree, often hardly more than a shrub, with strong, thorny branches; in the wild state, it forms a pyramid. Its leaves are large, long and pubescent on the lower surface. This medlar grows well on nearly all soils, provided they are not completely arid. In Japan, it is usually grafted on quince or medlar, never on pear or *Crataegus Azarolus* (Neapolitan medlar). It needs a fairly hot climate, but its flowering is not usually hindered by early autumn frosts. The Japanese medlar is cultivated in the pyramid form, or simply as a bush, and is little susceptible to insect attack or disease.

At the present time medlar plantations of greater or less extent are met with in the provinces of Nagasaki, Iyo, Shimonoka, Osaka, Kanagawa and Chiba.

The chief varieties now grown are the following:

Gékkeikan. — Fruit very sweet and juicy, large, ovoid, yellowish-white in colour; it has four stones. The tree is very vigorous and productive; it grows in pyramid form, and is rather dwarf.

Mogi-Biwa. — Fruits generally five in a bunch, ovoid, a little more spherical than those of Tanaka-Biwa; orange-yellow in colour, very juicy and sweet. The tree is vigorous and fairly productive.

Téraoutchi-Biwa. — Fruit very large, round and of excellent quality, very sweet. There is usually only one stone, except in some fruits at the top or bottom of the bunch; the fruit is yellowish white and has a very pleasant flavour; it ripens very early. The tree is very vigorous and fertile, and is dwarf in habit.

Tamoura-Biwa. — Fruit fairly large, very sweet and juicy, and of a yellow colour. The tree is fairly vigorous and productive on calcareous soils.

Tanaka-Biwa. — Fruit very large, sweet and juicy, with few stones. The tree grows vigorously, but is not very prolific. This variety is the most prized and is much grown throughout the country.

Wasé-Biwa, or Early Bibasse. — Fruit small, very early, rather acid.

Wasé-ô-Biwa, or Large Early Bibasse. — Fruit large, very sweet, yellow in colour. Tree very prolific, much prized.

Sangatsu-Biwa, or March Bibasse. — This is the earliest variety and begins ripening in March. Fruit rather small, dark yellow. Tree very vigorous and prolific. This variety is adapted to the southern parts of Japan and of France, as well as to Italy and Spain.

- 537 - **The Condition of the Olive Groves in the Lepino-Pontine and Venafro (Campobasso) Zones.** - BRACCI, PL.: in *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year XI, Series C, Parts 11 and 12, pp. 30-32 and 33-35. Rome, November and December 1912.

After having described the deplorable condition of the olive groves of these two districts, which have been left almost entirely without cultivation, the writer gives a detailed account of the cultural methods and parasite control necessary in order to keep olive trees in good bearing.

- 538 - **The Persian Walnut Industry of the United States.** - LARK, E. R. - U. S. Department of Agriculture, Bureau of Plant Industry, No. 254, pp. 110. Washington, February 1913.

A complete survey of the walnut industry, including an account of the history and distribution of the crop as well as a descriptive list of varieties and full cultural details.

- 539 - **The Exportation of Fruit from Portugal between 1906 and 1910.** - *Boletim da Associação Central da Agricultura Portuguesa*, Second Series, Vol. II, No. 1, pp. 37-38. Lisbon, January 1913.

This bulletin contains statistics of the amount and value of the oranges, pineapples, apples, grapes, chestnuts and other fruits exported. The total value of these in 1910 was £186 312.

The Queluz School of Pomology, which is under the direction of the «Associação Central da Agricultura Portuguesa», as well as the Government Experiment Stations, have begun selecting those varieties which are most prized in the markets.

## FORESTRY

- 540 - **The Forests of Bulgaria.** - WIESS, W. K.: in *Oesterreichische Forst und Jagd-Zeitung*, Year 31, No. 12, p. 106. Vienna, March 21, 1913.

The total area of the forests of Bulgaria is 7 515 418 acres, which are divided as follows:

State property . . . . .	2 230 950	acres
Communal property . . . . .	3 867 871	»
Private property . . . . .	1 284 075	»
Property of institutions . . . . .	132 522	»

The State forests are chiefly situated in the mountainous districts of the Stara Planina, Rhodope and Rila mountains and consist of 438 separate forests. The communal forest land lies more in the south and west of Bulgaria and includes 2966 forests. The private forests are scattered over small areas in the plain. The Bulgarian forests occupy about 30 per cent. of the total area of the country, but in the south of the country they amount to 60 or 65 per cent. There are about  $2\frac{1}{2}$  acres of forest per inhabitant; this proportion seems to be very satisfactory, but the smallness of the population must be taken into account.

With regard to the composition of these forests, deciduous species far outnumber conifers, and the following species are those which chiefly

occur: above 500 m. (1600 ft.) oak and beech predominate; beside these there are ash, poplar, plane, elm and willow; conifers are represented by pines, firs and spruce.

The vegetation can be divided into four zones;

1) A warm zone extending to 400 m. (1300 ft.) above sea-level. Here there were formerly vast forests, but much of the land is now devoted to agriculture; this zone has an east European vegetation.

2) A temperate zone, where the vegetation differs very little from the European flora, and some very large old trees still remain.

3) A zone reaching to 1300 m. (4300 ft.) above sea-level: beside conifers, beech is the prevailing tree; owing to its growing in places difficult of access, it is not readily turned to account; there are here beautiful stands of pure beech, or of beech mixed with ash and plane. The southern declivities of the Pila and Rodope mountains are clothed with pines; in the higher parts of the beech zone, spruce occurs.

4) Zone between 1300 and 2000 m. (4300 to 6500 ft.). This begins with beech mixed with spruce, the latter often forming thick stands; in the lower ground, grow firs, among which occurs *Pinus Peuce*, either in fine clumps, or as scattered individuals; above, at 1800 m. (5900 ft.) grows *Pinus Mughus* intermixed with spruce.

The ownership division from the point of view of altitude is shown by the following table, which gives the areas in acres.

	Up to 400 m.	400 to 1000 m.	1000 to 2000 m.
State property. . . .	732 707	858 821	638 841
Communal » . . . .	1 055 512	1 153 131	759 191
Private » . . . .	776 685	443 269	196 645
	3 465 021	2 455 224	1 594 677

As regards the height of the timber, the forest may be thus classified:

- 2 620 512 acres with trees of the average height obtaining in Europe;
- 4 894 411 acres with smaller trees, of which one quarter are conifers.

The annual increase of a large hardwood forest 100 years old and of good quality and normal density is 43.6 cub. ft. per acre, that of a slow growing wood of 20 years is 35 cub. ft. per acre of hardwood. The annual yield of coniferous high-forest 100 years old is about 81 cub. ft. per acre, while a slower growing 20 years' old conifer forest produces 59 cub. ft. per acre.

The total forest area of Bulgaria is estimated as worth £23 800 000. Bulgaria exports all kinds of hard and soft woods, both as raw material and in the form of manufactured articles. From 1898 to 1902, 29 730 tons of timber, to the value of about £47 784, were exported, while the imports during the same period reached 36 000 tons, worth £76 000. The imports have steadily declined, sinking from £140 443 in 1898 to £50 246 in 1902. The value of the exports, on the other hand, rose from £40 310 in 1898 to £61 996 in 1902.

Bulgaria chiefly imports soft wood and in the form of manufactured articles ; during the above-mentioned period, 75 per cent, of the wood imported was of this kind, while 50.5 per cent. of the exported wood, was deal. Of late years, the wood industry of Bulgaria has increased, but formerly only small articles of common use were made in household industry.

The timber of the State and communal forests is felled annually according to a plan drawn up by the ministry. The State either does the felling in its own and the communal forests, or else gives the work, by tender, to a contractor ; often the right of felling is disposed of by agreement to large contractors.

Afforestation is done on the initiative of the State and carried out under the supervision of the latter. As the ground is rich in nutritive substances, the young trees soon make strong roots and grow well.

Regeneration in already existing forests is done by natural means and according to a system of periodical felling, which is settled by the ministry according to the requirements of the different species of trees.

The State employs 500 foresters in the care of its forests, and 2135 are entrusted with those belonging to the communes ; this amounts to one forest guardian for every 4461 acres of State forest and one for every 1814 acres of the communal woods.

In spite of all regulations to the contrary, the peasants, as a rule, still allow their cattle to graze where they like, without the least consideration for the young plantations. The writer considers that if systematic and energetic measures were adopted, the time would yet come, when the forests would play a part of considerable importance in the State Budget, and the capital invested would bring in a satisfactory return.

## LIVE STOCK AND BREEDING.

VOLUME

- 541 - **An Enquiry made in 1912 to Determine the Causes, Frequency and Gravity of Rickets in Foals in West Flanders: the Measures to be Taken to Hinder the Spread of the Disease.** - ZWAGNEPOEL: in *Annals de Médecine Vétinaire*, Year 62, No. 2, pp. 69-87; No. 3, pp. 129-151. Ixelles-Bruxelles, February and March 1913.

Compiled from observations made on the subject by 23 horse-breeders.

- 542 - **The Disinfection of Hides and Skins Containing Anthrax Spores.** - JREB: in *Deutsche Schlacht- und Viehhof-Zeitung*, Year 13, No. 7, pp. 97-98. Berlin, February 1913.

Schattenfroh recommends common salt and hydrochloric acid for the destruction of anthrax spores. Another method worked out by Seymour-Jones consist in placing the hides for a long time in a mixture of formic acid and corrosive sublimate. Moegle (Stuttgart) set himself the task of testing the methods of both investigators and, at the same

time, he tried to substitute formalin for corrosive sublimate in Seymour-Jones' method. Zeeb describes his experiments in the above article.

- 543 - **Piroplasmosis in Sheep.** - VON BAIZ, SILIAN in *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 68, Part 1, pp. 191-200 Jena March 1, 1913

The writer's researches have proved that the sheep disease caused by *Piroplasma ovis*, which occurs in Rumania, Bulgaria and Turkey, as well as in Italy, Dalmatia and France, also exists in Hungary.

Detailed investigations have shown that the disease can assume an acute and a chronic form.

- 544 - **The Passage of Products of the Digestion of Albuminoids from the Mother to the Foetus.** - BUGLIA in *Biochemische Zeitschrift*, Vol. 14, Part 1, pp. 361-370, Berlin, February 1, 1912.

The above-mentioned investigations into the passage of non-albuminous nitrogen through the placenta were carried out at the Physiological Institute of the University of Naples. The writer injected into the *vena femoralis* of four bitches, far advanced in pregnancy, artificial products of the breaking up of albumen, which no longer possessed any albuminous properties, and then sought to discover these products in the blood of the foetus.

The injections were performed with extreme slowness, and with relatively large quantities.

After the injections were concluded, the body of the bitch was opened, the large vessels were ligatured, and the still living foetus taken out and beheaded.

The blood from the blood vessels of the neck was allowed to coagulate of its own accord, and then examined for albuminous and non-albuminous nitrogen. Before and after injection the albuminous and non-albuminous nitrogen content of the bitches' blood was determined. In some cases; the writer also examined the urine of the bitch, as well as the amnion and allantoic liquids.

For a comparison the blood of foeti and their mothers, which had received no injections, or only common salt injections, was afterwards examined as to its albuminous content. From a comparison of the results of the experiments, it was clearly proved that a portion of the non-albuminous nitrogen injected into the mother's blood had found its way into that of the foetus.

- 545 - **Utilization of Food by Zebras.** - PUCCI, C.: in *PA stockbreeders Colonial Year VII*, No. 1, pp. 11-28 + 2 figs., Florence, January 1913.

The writer, Director of the Stock Breeding Laboratory of the Royal Superior Institute of Experimental Agriculture at Perugia, having under his charge a young zebu bull of about two years of age and belonging to the Gujerat breed, which was completely accustomed to its new surroundings, set himself the task of observing the power of these

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Indian cattle for digesting various food stuffs in comparison with the capability shown by European breeds in this respect.

As a control was selected a young Podolian bull 20 months old from Todi, the result of a cross between the Val di Chiana (Umbrian variety) and the Maremma breeds.

At the time of the experiment, the weight of both animals was the same.

The experiments were divided into two series: in the first, the animals were fed on average quality meadow hay; in the second, on hay and earlnut cake.

Both animals were kept in the same shed and their dung and urine were collected with particular care.

After having ascertained the amount of food consumed by the two bulls, each was assigned a similar ration, according to its requirements.

The forage was examined first and subsequently the dung and urine.

The results of the first series of experiments proved that the two subjects showed no special difference in their power of absorbing various substances, with the exception of fat, of which the zebu absorbed a greater proportion.

Nevertheless, the latter animal showed a slight difference in favour of nitrogen, while the former absorbed more nitrogen-free extract and mineral substances.

Both bulls evinced a gain in nitrogen; this was, however, more noteworthy in the case of the Todi animal, since the zebu consumed more of this substance.

In the second series, with meadow hay and earlnut cake, the zebu absorbed more nitrogen, fats, nitrogen-free extract and mineral substances than did the other bull, which showed a slightly higher capacity for the absorption of cellulose. Further, the zebu show a considerably larger gain in nitrogen than the other animal.

Both bulls, on receiving more concentrated rations, increased in their absorption of almost all the nutritive principles, but the zebu did this to the larger extent. This proves its greater aptitude to digest and assimilate nitrogenous matters, fats, nitrogen-free extract and mineral substances. This agrees with the two animals' increase in weight and the proportion of nitrogen acquired by them during the experiment.

It is well to mention in conclusion that the two bulls drank different amounts; the zebu always required less water, which according to the writer, points to its being adapted to living in hot climates subject to periods of drought.

546 - **The Drawing Up and Printing of Pedigrees.** WILSDORF in *Monatblatt der Deutschen Gesellschaft für Zuchtstudien*, and in *Zeitschrift für Gesehskunde und Phord-nicht*, Year 8, Part 3, pp. 63-6. Hannover, March 1913.

A glance at the more recent literature dealing with the subject of animal breeding shows that the pedigrees are drawn up and printed in different ways, which greatly increases the difficulty in tracing lines of ancestry.

The writer suggests that pedigree tables should be drawn up uniformly in the manner adopted by the "Institut für Zuchtstudien" and the "Deutschen Gesellschaft für Züchtungskunde" in the publications dealing with animal breeding.

The form suggested by the writer, is given on page 779 on a somewhat smaller scale, on which is shown the pedigree of "Undine." The following points should be noticed in drawing up and in using these pedigree tables:


- 1) Pedigree tables must be symmetrical in all their parts.
- 2) The normal-sized form (1) for manuscript entries is 7.3×4.6 in. A thick black line should enclose the table, which should be divided in the centre by a thick horizontal line drawn from the line marking off the first division (i. e. from left to right). In the case of short pedigrees, forms of half or a quarter the size are sufficient.
- 3) The list of ancestors should always be printed with the narrow side up; the descendant (Undine 8348) on the left in the first longitudinal division.
- 4) The father of the offspring is entered in the upper half of the second longitudinal division, the mother in the lower half, and the grandparents are then entered in the 4 compartments of the third longitudinal division.
- 5) In the first three narrow divisions (on the left) the names and number must be written in a perpendicular direction; but horizontally in the three following divisions; the names in the latter divisions should be written immediately before the line separating off the small divisions on the right.
- 6) In the 1st, 2nd and 3rd longitudinal divisions, the names are to be written in each compartment, in such a manner that the dividing line, which cuts the right edge of the table, reaches the centre of the name with the number.
- 7) The numbers are placed, without the letters "No.", exactly after the names in divisions 4 and 5; in the case of longer names, the number can come immediately below the latter.
- 8) In the 6th longitudinal division, the parents of the animals therein entered are frequently given, in which case it is necessary that the name of the father should be written above that of the mother in the right half of the division; a more distant progenitor can be entered

(1) To be obtained from the Geschäftsstelle der Deutschen Gesellschaft für Züchtungskunde, Berlin-Halensee, Halberstadtstr. 3.

on the right; thus in the 6th division of the accompanying pedigree table belonging to "Undine" beside Olga 1 are given the names of her parents, Matador 589 and Olga 4817 and, further, their father Primus 91 is also clearly entered.

If the names are written small, there is room in the division for several generations of ancestors.

9) Wherever the name of an ancestor is missing, a short horizontal stroke should be made in the right place in the written table, (see in the cases of Robert and Hukla). In printing, these strokes may be omitted. They should only be used when it is certain that the ancestors are unknown.

10) Should more distant ancestors, or other important relationships or combinations be known in the case of the animals figuring in division 6, which it is impossible or undesirable to enter, the sign  should be entered behind the name of the animal in the manuscript pedigree. (See Primus 91 next to Olga).

11) Entries in the pedigree tables must be written legibly.

12) The reading of manuscript pedigrees is greatly facilitated if the names do not adjoin the lines. In the sixth longitudinal division, sufficient space should be left (about 5 mm) to allow of the insertion of figures if necessary.







13) In the longitudinal divisions 4 and 5, the initials of names of equal length should come directly under one another, and this arrangement should be observed in the case of all the initials in division 6.

14) The names of animals which occur many times in a pedigree can be represented by filled or unfilled signs; these must be placed behind the numbers of the animals in divisions 2 and 4, above the centre of the name in divisions 3 and 5, and before the names in division 6. Large signs are used for the nearest ancestors and smaller for the more distant ancestors, which are entered further to the right. Animals which are related, but have a somewhat different line of descent, are represented by unfilled signs, in which the amount of "blood" which they have in common with their mate, can be expressed by a fraction. (1)

15) The compositor must use exactly the same signs as those given in the written pedigree. Larger and smaller signs of the same kind must only be used for the same animals, or related ancestors.

16) In manuscript pedigrees, the signs which denote ancestors, or relatives on both the father's and mother's sides, should be written with black ink (e. g. Matador); signs which only represent ancestry on the one side should be red (e. g. Elso 2011); those which only represent a quarter or an eighth of common ancestry are coloured green (Sturm 1213).

(1) Example: Enzian 4237 has  $\frac{1}{2}$  the blood of Gregor 2356 and  $\frac{1}{8}$  that of Eicke 1811, or he has  $\frac{1}{4}$  of the blood of Elmar 1656, Gesine 6404, Matador 589 and Eiluhorn; of these animals, only Gesine 6404 does not appear in the pedigree of Editha 1817; Enzian 4237 has therefore  $\frac{3}{4}$  of the same blood as the last-mentioned animal.

Undine 8348	Elso II 34	Elso 2011  (red)	Oskar 1535	Robert 1325	Matador 589
			Hul'a 7829	—	—
Walküre 7819	Caesar 1710	Sarah 4688	Else 6448	Bernhard 778	—
			Elvira 5042	Ajax 428	—
			 (red) Eginhard 2072	Lottchen 2415	Palk 71 Lotte 783
			Oskar 1553	Robert 1325	Matador 589
			Eleanora 5392	Hulda 7829	—
			Heinrich 1386	Bernhard	—
			Stadtwyk 9274	Emma 3508	Iva 3091
			Stadtwyk 2395	Roland 1088	Matador 589 Alma 2488
				Olga I	Matador 589 Olga 4817 Pr 91
				—	—
Edelweiss 6905	Gregor 2358	Editha 1817	 (green) Sturm 4681	Wodan 825	Ajax 536
			 (green) Agnthe 5681	Inka 4731	Pauline 2843
			 (green) Hanzian 4237	Wexlan 825	★ Primus 91 Diana 979
			 (green) Editha 1817	Clara 3170	✦ Alma 2588
				Gregor 2358	Ajax 536
				Inka 4731	Pauline 2843
				Wexlan 825	★ Primus 91 Diana 979
				Clara 3170	Hertlia 986
				Editha 1817	Elmar 1656
				Editha 1817	Gesine 6404
Edelweiss 6905	Editha 1817	Editha 1817		Matador 589	—
				Inhorn	—
				—	—
Edelweiss 6905	Editha 1817	Editha 1817		son of	Matador
				Inhorn	—

17) The compositor may abbreviate long names in division 6, but no other alterations are admissible. Abbreviations can only be used where the names have occurred in full in earlier divisions of the table. Should the space in division 6 be insufficient for the names and numbers and signs of further ancestors, the signs alone are entered. Explanations of the pedigree, breeding information and premiums should be entered on the back of the form. But in the 1st longitudinal division (allowing a suitable interval) the name of the breed can be entered below (on the right) and the date of birth (above) on the left.

11. **Live Stock Breeding in the Sierra do Norte in Peru.** — BROGGI, ALFREDO: in *La Riqueza Peruviana*, Vol. II, No. 13, pp. 567-573 Lima, January 1914.

On account of the distance of the Sierra do Norte from populous centres and of the lack of roads, stock breeding in this region is still practised on primitive lines. The estates are very extensive — up to 25 000 and 50 000 acres; sometimes the same owner possesses adjoining estates reaching from the coast to the mountains.

The estates are divided into “campos,” “potreros” and “inviernas.” The “campos,” which occupy the greater area, are not enclosed and they are grazed during the rainy season. The “potreros” include the best pastures and are mostly surrounded by dead hedges or by ditches. They are reserved for the use of weak and young animals during the dry months; the “inviernas” are irrigated meadows often enclosed by dry stone walls and sown to “paja chilena” or “paja parda” (*Stipa* spp.) and devoted to the fattening of the cattle to be sold during the year. Sometimes the “potreros” also are sown with “paja chilena,” or settlers are allowed to grow cereals in them on condition of leaving the stubble for forage.

The “inviernas” are sown by hand, a pick being used to prepare the soil which is too irregular and too stony to be ploughed. The ground is resown every 10 to 15 years.

It is customary to give any agriculturist who settles on the estate, as farmer, a certain extent of land, on payment of a trifling rent (1 to 10 soles that is 2 to 20 shillings) and of a share of the produce (beans and maize); the farmer has also to assist in the performance of certain work, his share amounting in all to 30 days per annum, and to pay 1 sol (about 2 shillings) for grazing rights per head of cattle per year. Strangers pay twice as much. This promiscuity is often injurious to the cattle of the estate, which gets crossed with inferior animals.

Once a year, at the approach of the rainy season, a general inventory is made of the live stock, taking the herds — that is the cattle entrusted to one herdsman — in succession. It is then that the animals are branded and eventually castrated. In some estates the cattle are rounded up a second time at the end of summer, when the animals to be fattened are picked out. Where horses and cattle are bred the inventories are made separately.

It takes from 3 to 6 months to fatten cattle in the “inviernas.”

The cattle of the Sierra is smaller and not so well built as that of the coast, where selection and crossing with improved breeds is practised. Nevertheless, even in the Sierra do Norte, a breeder has introduced excellent Hereford bulls.

The chief and most profitable industry is the fattening of cattle, though some cheese is made. The cows are milked only during two or three months in the year and they yield barely a quart of milk per day. Both cheese and butter are made very imperfectly and with the most rudimentary utensils.

A good deal could be done for the improvement of breeding in the Sierra do Norte. The climate is mild, the temperature rarely sinking below 10° C. and the rains are abundant in the summer; consequently, with a relatively small amount of labour, plenty of pasture might be secured all the year round. There are no cattle diseases. The liver-fluke is the parasite most to be feared.

Sheep breeding would find favourable conditions, especially in the "puna" or higher part of the Sierra, but it is not so profitable as cattle raising. Some years ago Merinos were introduced, but as no proper care was bestowed on the crossing, the flocks soon degenerated, and now they have not much more wool than the native (criollo) breed. The death rate is rather high, chiefly owing to staggers, so that often the yearly increase is not above 10 per cent. There are also many ticks. The average yield of washed wool per head is from  $\frac{1}{2}$  to 1 lb. per head. It sells at 8 to 10 soles per arroba ( $7\frac{1}{2}d$  to  $9\frac{1}{2}d$  per lb.) The average price of sheep is about 4s and of fat sheep about 6s.

548 - **The Fat Stock at the General Stock Show in Paris.** - VOTTELLER: in *La Vie Agricole et Rurale*, Year 2, No. 14, pp. 381-384 Paris, March. 8, 1913

This report gives advice as to fattening and exhibiting stock, as well as information respecting the success obtained with various French breeds of cattle, sheep and pigs.

549 - **The Prussian Half-Bred Horse.** GANZERI: *Unser Halbblood*. - *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 20, p. 183. Berlin, March 8, 1913.

The writer mentions the criticisms, which are often passed upon the East Prussian horse and shows how its early maturity may be turned to account without detriment to its excellent qualities.

550 - **East Prussian Studs and the Supply of Horses for the Army.** - GOLDBUCK: in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 24, pp. 224-225, Berlin, March 22, 1913.

Information respecting the development of the East Prussian remount studs and the present breeding of remounts, together with an account of the importance of this work for the army. The last section gives a list of the best private studs.

HORSES,  
ASSES AND  
MULES

**551 - The Austrian Cattle Census of December 31, 1910, and the Fluctuations in the Number of Cattle since 1900, especially as regards Milch Cows.**

J. DIRLIK: in *Österreichische Molken-Zeitung*, Year 20, No. 3, pp. 65-66, Vienna, March 1, 1913.

In 1910, the total number of cattle in Austria amounted to 9 160 009; of these 4 901 856 were cows and 1 154 283 steers. In comparison with the 1890 cattle census returns, there is a decrease of 3.7 per cent.

This falling off is chiefly in steers (20.7 per cent.) and bulls (16.5 per cent), for the cows have increased 3.3 per cent., owing, in the writer's opinion to the increase of dairy-farming. The number of cows has risen from 50 per cent. to 53 per cent. of the total horned stock, but this increase has not kept pace with the growth in population. While in 1900, there were 181.5 cows per 1000 inhabitants, this number had fallen to 171.6 at the time of the last census.

The number of cows has decreased every where in the Alps, except in Lower Austria. This is especially noticeable in Carinthia (7.1 per cent.), in Carniola (6.8 per cent.), and in the Vorarlberg (6.8 per cent.)

In the Sudeeten and Carpathian districts a considerable increase is to be observed: 7.8 per cent in Moravia, 5.8 per cent. in Galicia and 9.2 per cent. in the Bukowina. In Salzburg, there are 329 cows per 1000 inhabitants (the maximum), in Upper Austria 323, in Carinthia 229.9, in the Tyrol 229.5 and in the Vorarlberg 226.8. while in Dalmatia the number sinks to 45.5 (minimum).

Rearing young cattle seems to be most extensively practised in Styria, Carniola, Göriz, Gradiska, Bohemia, Moravia, Silesia, Galicia and the Bukowina.

**552 - A Contribution to the Knowledge of Tarantais Cattle from the Zootechnical and Economic Standpoints.** - HOFFMANN: in *Mitteilungen der landwirtschaftlichen Lehranstalt der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part. 3, pp. 309-357, Vienna, January 15, 1913.

The detailed investigations of the writer led to the conclusion that Tarantais cattle ("Race tarantaise," or "Race tarine") of south-east France are not, as Boucher supposed, the result of a cross between the "Race Jurassique" (Swiss spotted cattle) and the "Race des Alpes", but a separate pure breed. In order to determine the descent and relationships of these cattle, the writer made comparative examinations of their skulls, of which the results justified the conclusion that the Tarant cow is a direct descendent of the old lake-dwellers' cattle, which were once found everywhere throughout Savoy. Some primitive characters of the lake-dwellers' cattle seem to be still latent in the Tarantais. The structure of all the skulls examined showed a considerable improvement upon the type belonging to the pre-historic breed. The writer especially noticed a shortening of the face and a corresponding broadening of the forehead and back of the head, from which he came to the conclusion that this short-horned breed was not only more highly developed, but that its development had proceeded along brachycephalic lines. This small amount of brachycephaly is not, in his opinion, to be attributed to a mixture of breeds.

Therefore the Tarantais cattle should be placed in the zootechnical system between the third and fourth forms of the type "*Bos taurus europaeus*." Dr. Hoffmann gives a detailed account of the Tarantais breed, which has hitherto been little dealt with in books on cattle.

- 553 - **The First Show of the Red Cattle of Central Germany at Biedenkopf.** — KREIER in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 1, pp. 1-130; No. 1, pp. 150-151. Berlin, February 8 and 12, 1913.

This is a report of the first exhibition of breeding cattle, which was held by the Federation of Breeders of the Red Cattle of Central Germany at Biedenkopf last autumn. To this Federation, which was founded about eighteen months ago, there are now affiliated 22 Breed Associations with about 10 000 head of cattle. Its object is the improvement, by means of selection, of the breeding stock of the native red cattle, which are kept in the mountainous districts of Central Germany and in Silesia. The aim of the Federation is to obtain an animal good for milk and meat production and also for work, and which is better adapted to the needs and economic capacity of the different breeding districts.

An attempt is being made to unite higher milk yield, greater weight, a better formed hind quarter, a more powerful muscular development of the thighs, as well as earlier maturity, preserving at the same time its special aptitude to draught purposes. The live-weight of three-year-old bulls should be from 1320-1980 lbs. and that of five-year-old cows from 880-1540 lbs. The head and neck should be moderately long and strongly attached, the fore quarter and chest deep and wide, the shoulder long and sloping, and the back straight. A broad rump, long pelvis, regularly formed udder, clean powerful limbs with short pastern, and hard hoofs are also required of the typical red cow of Central Germany.

The proof that the Federation is not aiming at impossibilities has been given, according to the writer, by this first show, where a considerable number of animals were exhibited, which have nearly attained the breeder's aim. The report contains pictures of many of the breeding cattle shown.

- 554 - **The Slaughter of Cows in Calf and Its Influence on Beef Production.** — BRECHM: in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 13, pp. 140-150; No. 14 pp. 159-160. Berlin, February 11 and 15, 1913.

In 1910, Dr. Buchem drew up statistics of the number of in-calf cows slaughtered in the Cologne slaughter-house. He extended his investigations to the weight of the uterus, as well as to the weight and age of the foetus. The statistics showed that 16.5 per cent. of the cows were in calf, and most of them were not over four years old. With advancing age, the writer found a decrease in the number of cows in calf slaughtered. The number of cows in calf slaughtered was larger in October and smallest in June. The annual average was exceeded in September, November, December and January, from February onwards the number fell below the average; and from July, it again rose notice-

ably. The pregnancy was usually of 3 or 4 months' duration, least often as much as 8 or 9 months.

The weight of the mother with the foetus was, in the case of 3 or 4 months' pregnancy, 9 to 15 lbs. The uterus of cows not in calf averaged 1½ lbs. The extra weight of the uterus due to pregnancy was 33,000 lbs. The total number of foeti weighed 11,850 lbs. If these results be applied to the whole country, as may reasonably be done, seeing that similar or the same percentages have been obtained in many other slaughter houses, it follows that 298,546 cows in calf are annually slaughtered in Germany; consequently over 1000 tons of meat are lost by the destruction of the foeti. The writer considers that German farmers would be able to produce and supply all the meat required by the population, if fewer pregnant cows were slaughtered.

In order to attain this end, Dr. Buchem recommends the declaration of the meat of pregnant animals and the legal application of breach of warranty to cases of the sale of cows in an advanced state of gestation.

**555 - Influence of Alpine Grazing and Weather on the Milk-Yield of Cows.** - ULMASSKY. Über den Einfluss der Alpengrazung und der meteorologischen Faktoren auf die wirtschaftlichen Leistungen von 27 Kühen der Anstaltsherde in Rotholz, Tirol. *Monatsschrift der Landwirtschaftlichen Lehrkanzeln der K. K. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 3, pp. 339-371. Vienna, January 15, 1913.

During the summers of 1910 and 1911, the writer made fortnightly test milkings and determinations of the fat content of the milk of 27 cows at the Rotholz Provincial Agricultural Institute in the Tyrol. At the same time, the meteorological conditions were closely observed, in order to determine whether they had any influence upon the cows' performance.

The animals belonged to the grey-brown mountain breed and spent the greater part of the summer in question on an Alpine meadow, only 6 cows remaining in the valley. All the cows were weighed at the beginning and end of the grazing period, and the weight of their calves at birth was ascertained.

From the tables and diagrams giving the milk yield and fat content and also the different meteorological factors (temperature, atmospheric pressure, precipitation, etc.), practically no regular influence of the latter upon the amount of milk or the fat content of the milk can be determined. Snow was the only factor which reduced the milk yield.

The cows which had grazed on the alp gave a little less milk than those which had been kept on the valley pastures, but the fat content of their milk was slightly higher.

**556 - The Variations in the Composition and Properties of the Milk from the Individual Cow.** BECKLES, C. H., and SHAW, ROSCOE H. U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin 157. Washington, 1913.

The writers investigated the milk of 7 cows of different ages and ~~was~~ <sup>was</sup> kept about a fortnight (sometimes also for a shorter period),

in order to ascertain the composition of the milk and the variations in the protein, sugar and fat content, as shown by the Reichert-Meißl, iodine, and saponification values and the melting points. The details are given in tables.

557 - **The Milking Tests of Tyrolese Cattle-Breeding Associations.** KUBRAT : in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 11, pp. 392-393, Vienna, March 22, 1913.

This article gives the data collected during a period of five years, and referring to the different breeds of cattle kept in the Tyrol.

558 - **The Moscow Sheep Breeders' Congress and Exhibition.** - TRELSCHOW : in *Zeitschrift für Schafzucht*, Part 3, pp. 10-12, Hannover, March 1913.

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In October 1912, a Sheep-breeding Congress for the promotion of this industry in Russia was held at Moscow in connection with an exhibition of sheep, which included a scientific section and one devoted to demonstrations connected with the wool industry. During the sittings of the Congress, at which the writer was present, much stress was laid on the fact that Russia did not require any more to import sheep, or in any case only to a limited extent.

There are, at the present time, 87 million sheep in the country; these may be divided into two categories, producing fine and coarse wool respectively.

Of the first type there are 6 millions, including different breeds of Merinos. The other 81 millions consist of short-tailed, fat-rumped, broad-tailed and long-tailed sheep, of which the last are bred for meat, milk and fat and also for their fur. From the information supplied to the Congress, it appeared that sheep-breeding had only declined in the districts where pure bred Merinos were kept. The proportion of sheep to the population varies in different districts: in some there are 30 sheep per inhabitant; in others 200, this very high figure occurs in places remote from centres of communication, and it was part of the work of the Congress to open up such districts.

The Russian Merino sheep, to which the writer devoted special attention, is a typical exclusively wool-producing animal. As flocks of Merinos only occur isolated in Germany and the German breeder's aim is totally different from that of the Russian farmer, there is no question of importing Merinos into Russia from Germany.

English breeds and their crosses have not proved very successful in Russia, so that breeders in that country have to resort, more or less, to the systematic improvement of the numerous native breeds of sheep.

Of the many breeds exhibited, the writer describes the Kurdjuck and Wallachian breeds.

The large Kurdjuck sheep; is a native of South Russia, and belongs to the fat-rumped type; it is reared for meat and fat only, as its fur is poor, but it is resistant and thrifty. It reaches its full size at the age of 6 months. The measurements taken by the writer of an adult ram

were as follows: height at withers 35 inches, breadth of chest 9 in., depth of chest 15.3 in., total length, without cushion of fat, 3 ft 0.6 in., with fat cushion, 3 ft 4.5 in., the latter can weigh up to 33 lbs.

M. Telschow opines that this breed would also be profitable in Germany, especially if crossed with the native breeds, and would thrive in heath districts, where the food conditions are very variable. These sheep are also suitable for crossing with the South-West African fat-tailed breed.

Many crosses have been successfully made in Russia, especially with Merinos.

Wallachian sheep are chiefly bred for their fur, and in addition to producing the valuable Pollschu ram fur, they also furnish a good deal of meat. The writer is of opinion, that these sheep might be kept with advantage also in Germany, and after giving a short account of the many exhibits dealing with sheep breeding, which were shown in the Wool Industry Section, he expresses the hope that one day, on the occasion of such a Sheep Exhibition, an International Sheep Breeder's Congress may also be held in Germany.

559 - **The Improvement of the "Mangalicza" Breed of Pigs in Hungary.** - KOVACS, BELA, in *Mezőgazdasági Szemle*, Year XXXI, No 3, pp 17-17; Budapest, March 1917.

This breed is much prized in Hungary for its fat-producing qualities and its adaptation to the conditions of climate, soil, and food obtaining in that country.

It has, however, the serious defects of not being sufficiently prolific or early maturing and to these causes must be attributed the exhaustion of the Mangalicza breed. It was therefore necessary to cross it with another stock, which without altering the qualities which render these pigs indispensable to Hungary, would at the same time increase their prolificacy and accelerate their growth. The necessary qualities have been found in the Lincolnshire breed; this was introduced for the first time and exhibited at a Show of breeding stock held in Hungary two years ago.

Of the various English breeds of pigs, the Lincolnshire is the one which fattens best, and most resembles the Mangalicza in its shape and curly, white hair. Further, the crossing experiments made during this short time already showed that the cross-breeds of the first generation fulfilled the wishes of the breeders in every respect; the animals developed more quickly and were more prolific without in any way losing their property of easy fattening. On the contrary, with the same food, they attained a heavier weight than pure-bred Mangalicza pigs.

Many Hungarian breeders, encouraged by these results, began to turn their attention to Mangalicza-Lincolnshire crosses. The following information has been given by two breeders respecting Mangalicza crosses:

At Balatonföldvár, M. Márkus kept pure bred Mangalicza and Mangalicza X Lincolnshire pigs in the same herd and on the same rations.

The average weight of the pure bred young pigs when  $8\frac{1}{2}$  months old was 119 lbs., while that of the Mangalica  $\times$  Lincolnshire pigs of the same age was 165 lbs.; the hybrids thus weighed 46 lbs. more than the others, which represents a difference in value of 17s. 5d. per head. The breeder considers that, when the pigs are one year old, the difference in their weight will amount to from 77 to 79 lbs. per head in favour of the improved Hungarian breed.

At Kajdacs, M. Blascsek selected 328 young cross-breeds, of which the weight, at the age of 6 weeks, was from 35 lbs. to 55 lbs. Their weight at 6 months was 132 lbs.; they were used for breeding purposes at the age of 11 to 12 months. The castrated pigs weighed 550 lbs. per pair, at 14 months, and gained 392 lbs. in 4 months, while pure-bred Mangalica animals only weighed 484 lbs. per pair when 2 years old, and only gained 345 lbs. during the same time and with the same rations.

On the writer's farm, cross-bred pigs weighed from 220 to 264 lbs. the pair at the age of  $6\frac{1}{2}$  months and from 282 to 330 lbs. when  $7\frac{1}{2}$  months old.

It is very difficult to acclimatize the pure-bred Lincolnshire in Hungary, especially when it is first imported; many animals have to be rejected; but after the first year, they often prove excellent breeders.

The sows are very prolific and rear their young very well; the latter develop rapidly.

500 - **A Contribution to the Knowledge of the Length of Pregnancy in Goats.** — MACHENS: in *Berliner Tierärztliche Wochenschrift* Year 29, No. 10, pp.187-189. Berlin, March 6, 1913.

GOATS

144 animals were the subjects of these investigations. Some of the goats belonged to the Harz breed, others were crosses between native goats and Harz, Saanen, and Toggenburg animals. The length of the period of pregnancy, which varied with the age of the goats, was from 142 to 164 days, from which fact the writer draws the conclusion that the variations hitherto allowed for were too slight.

## FARM ENGINEERING.

561 - **Trial of Bone-Mills.** — KUBSER: *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 237. Berlin, 1913.

AGRICULTURAL  
MACHINERY  
AND  
IMPLEMENTS

The competition held by the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft) on July 7 and 8, 1912, in the Central Poultry-breeding Establishment of the Chamber of Agriculture for the Province of Saxony has shown that decided progress has been made since the competition held in 1909.

The object of these bone mills is to reduce bones, both raw and steamed or boiled, to a form suitable to be used as food for animals (poultry, pigs, etc.).

Four hand machines and two power driven machines were tested. The tests were conducted as follows: firstly half a pound of bones of different kinds were given to each machine and the time each took to grind them was noted. Then a dynamometer was connected with the machines and observations were made as to the quantity of the same material that could be ground in two minutes. Further the commission ascertained the performance per hour, the amount of power required, and examined the quality of the meal produced.

The above tests yielded the following results:

#### A. HAND MACHINES.

*No. 1. Hand bone-mill with fly-wheel:* D. R. P. (1) No. 242 002. — This mill grinds per hour 20 to 22 lbs of boiled bones, 11 to 13 lbs. of raw bones or 6 ½ to 9 lbs. of hard limb-bones. Its price is 28s 8d. The opinion of the judges was as follows: Provided the device for fixing the mill be improved, machine No. 1 may be declared specially suitable to small concerns, as it yields a very good meal free from splinters and is also very cheap.

*No. 2. Bone-mill with crank:* D. R. P. No. 242 002. — The output is about 11 lbs. per hour. The price of the machine is 24s 6d. The judges' verdict was the following: This machine turns out a meal somewhat inferior to that produced by machine No. 1, but still fairly good. Its output is also less and it is not so easy to work and to clean. On the other hand, thanks to an ingenious device, it can easily be fastened to tables projecting but little over their frames. Considering the very slight difference in price, machine No. 1 is decidedly to be preferred.

*No. 3. Bone and Universal Mill "Heureka" (Moh's system), B. Model worked by hand:* D. R. P. No. 217 638. — It grinds from 4 ½ to 11 lbs. per hour. The price of the mill is 24s 6d. The judges' opinion was the following: Machine No. 3 gives, especially with household bones, a good meal. It is easy and safe to work, and relatively cheap.

*No. 4. Bone and Universal Mill "Heureka" (Mohs' system), E. Model with fly wheel, worked by hand:* D. R. P. No. 217 638. Its output is stated to be 8.8 to 26.2 lbs. per hour. Power required: one man. Price £1 3s 3d. The judges' opinion was the following: The mill turns out, especially with household bones in a short time a good quantity of excellent meal, but when working to its full capacity it is too tiring for a man of normal strength. It is besides too dear.

#### B. POWER DRIVEN MACHINES.

*No. 5. Bone and Universal Mill "Heureka," Z. Model:* D. R. P. No. 217 638. — The output is said to be 66 to 77 lbs. of coarse meal per hour. The power required to drive it is indicated at 1 H. P. The price is £14 14s. In the opinion of the judges the machine as it is at present is not to be recommended owing to the danger attendant on

its use and to the splintery nature of the meal produced from household bones and ribs.

No. 6. *Bone Mill No. 8.* --- The machine is stated to grind 110 lbs. of bones per hour. The power required is indicated to be 2 H. P., and the price £12 5s. The judges consider it to answer all just demands upon it. The mill produces per hour a good quantity of excellent meal from all kinds of bones, and if it were somewhat cheaper it could be still more highly recommended.

**562 - Abstracts of recently published Patent Specifications. (England).**

21483. *Swede and Turnip Harvesting Machine.* (September 29, 1911).

This invention relates to a machine for harvesting swedes, turnips, mangel wurzels, beetroots, etc. It comprises a floating cutting device, to sever the tops, arranged at the front of the machine and adapted to be moved up and down to suit the height of the root tops, a tailing device consisting of a transversing horizontal blade which passes under the root and severs the tail, leaving the same in the ground, an elevator behind the tailer, and a cleaner into which the roots are delivered by the elevator.

12058. *Grain or Seed Drilling Machine.* (May 21, 1912).

This invention relates to improvements in a grain or seed-drilling machine, and consists in providing it with two sets of sowing funnels and two sets of coulters so connected that, according to the direction of movement of the machine, one or other of these sets can be brought into position for service. The drill may be worked either by animal or motor-power. In the former case if it be desired to reverse the motion of the machine the animal must be harnessed at the other end of the machine, but in the latter case to obtain the change in direction required it is only necessary to reverse the motor or to reverse a gear which is mounted in a suitable place on the carriage frame.

27529. *Machine for Sowing Mangold, Turnip, and other Seeds.* (December 8, 1911).

The object of this invention is to provide an improved machine for sowing turnips, mangold and other seeds, which will reduce waste by sowing the seed in bunches at equal spaces apart in the drills.

283. *Motor Plough.* (January 3, 1912).

This invention relates to motor ploughs, and its chief object is to prevent breakage of the implement or of any of its parts if any of the shares should be arrested by a large stone, the root of a tree, or the like. Preferably, the arrangement is such that the shares are connected to the carrier or frame through the intermediary of a spring or springs in such a manner that the said spring or springs is or are extended or compressed when any of the shares are moved relatively to the frame, the said movement being transmitted to the disconnecting device so as to operate the same for disconnecting the motor. The invention further comprises improvements in the traction wheels of the plough, in order

to prevent slipping of the wheels, without any earth sticking to the same.

425. *Motor Plough*. (January 5, 1912).

This invention has reference to motor ploughs of that kind wherein the plough breasts can be raised or lowered and regulated as to their working depth. One feature of the invention is the means employed for adjusting the forward ends of the plough beams relatively to the draw bar. In order to raise the breasts by hand, a spool is mounted on a power shaft, which spool can be rotated by a manual lever to raise the breasts with which it is in operative connection. When elevating the breasts by power, a device actuated automatically by the movement of the plough beams is employed for stopping the movement of the breasts after being raised a given height. A further feature of the invention consists in the provision of improved mechanism for limiting the lowering of the breasts beyond certain limits. The downward movement of the breasts is controlled by a brake shoe acting on a brake drum, the said shoe being actuated by a lever which in its initial movement releases ratchet and pawl mechanism holding the plough breasts in their elevated position, and in its continued movement operates the brake shoe to control the breasts. The breasts are held in operative position by means of resilient supports, the tension of which can be individually and collectively regulated.

28797. *Manure Distributor*. (December 21, 1911).

This invention has for its object to provide an improved manure distributor so constructed as to ensure a positive and efficient feed of the manure and a good distribution on the ground; to prevent undue working of the manure in the hopper; and to facilitate the cleaning of the distributing mechanism.

29358. *Motor Driven Cultivator*. (December 30, 1911).

The purpose of the cultivator described in this specification is more particularly to pulverise and bank soil on both sides of a row of plants.

11949. *Power Driven Plough*. (May 20, 1912).

The invention relates to power-driven ploughs of the type comprising a tractor and a plough coupled therewith, and has for its object certain improvements in this class of apparatus, relating more particularly to the method of coupling the tractor's plough frame, and to the associated appliances for manipulating the plough shares from the tractor.

4910. *Clutch Gear for Agricultural Machines*. (February 27, 1912).

According to this invention, improved transmission gear is made use of which connects the seat or the pedal to the clutch spring, and comprises a sliding member round which the connection passes, the said member being made to slide at will by means of a system of auxiliary gear which the driver can operate when he is seated for causing the action of the geared working parts to cease at will.

7814. *Rotary Harrow*. (April 1, 1912).

This specification describes improvements in the driving and operation of rotary harrows of the type in which the harrow is driven indirectly from the main driving wheels through countershafts. Accord-

ing to this invention the counter-shafts are carried by a framework to lie above the main shafts of the wheels and are driven from these latter by pinions, the final drive from the counter-shafts to the harrow roller being by chains.

4157. *Grain Harvester*. (Feb. 19, 1912).

The object of this invention is to provide a new grain harvester, arranged to cut the grain and bind it while in an upright position.

### 563 - New Patents (German Empire).

*Patent No. 9225/45 a.* (6. I. '13). — This drum for holding the blades of a picking plough [Fräsel pflug (1)] consists of disks mounted on a square axle and connected with each other by ties. Between the disks rings are placed, and according to the width of the rings used the distance between the disks may be varied.

*Patent No. 20981/45 a* (2. I. '13). — In this machine for tilling the soil by means of several implements mounted on a revolving shaft, and which in order to free them from weeds and the like can be set to work successively, the worm wheel of the implement bearing shaft as well as the worm wheel of the crank shaft of the bearing wheels can be driven independently of each other by a common shaft.

*Patent No. 10897/45 a.* (6. I. '13). — Subsoiler for ploughs. This implement pivots round a pin in the lower end of an adjustable plate, which is fastened to the land-side plate of the plough and is connected with a spring which comes in to action only when considerable obstacles are encountered, such as big stones.

*Patent No. 65206/54 c.* (20. I. '13). — Machine for lifting beets; consists of shares and of arms connected with the shares by articulated joints. The arms have an up and down motion and are so arranged that they move towards each other.

*Patent No. 65740/45 a.* (20. I. '13). — Machine plough on the double engine system. An endless cable is wound round the winding drums and each portion of cable draws an implement forwards and backwards.

*Patent No. 255087/45 c.* (28. XII. '12). — Automatic tying device for straw presses. The invention consists especially in the arrangement according to which the hinder shaft itself revolves slowly and couples with the main driving shaft, thus starting the knottor, whereas formerly the measuring wheel shifted a stop for the coupling pawl.

564 - *Observations on Traction Engines*. — RINGELMANN, M.: in *Annales de l'Institut National Agronomique*, Series 2, Vol. II, Part. 2, pp. 221-241. Paris, 1912.

The writer shows with the help of diagrams and tables the results obtained in the course of 16 tests carried out with 9 different implements for working the soil. He arrives at the following conclusions: If the average draught power be taken as 100, the maximum power ranges

from 110.55 to 154.70 and is required for a distance ranging from 2 to 27 per cent. of the whole distance. The great differences observed with the various machines are solely due to the nature of the soil.

The writer therefore proposes to adopt 100 for the average haulage power and 175 for the maximum. He represents the former by  $t$  and the latter by  $T$  and establishes the following equations

$$\begin{aligned} T &= 1.75 t \\ t &= 0.57 T \end{aligned}$$

It is therefore recommended to base the calculations for a traction engine, both as regards its performance and the resistance due to friction, upon  $1\frac{3}{4}$  the average haulage power.

565 - "Case" Steam Traction Engine. — DE CONDÉ, M. F.: in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 111, Second Half-year, No. 4, Vol. 118, pp. 547-551. Paris, December 1912.

The writer, after giving an accurate description with figures and principal dimensions of this repeatedly and successfully tested machine, gives an account of the results obtained at the trials made at Chelles and at Bourges respectively, with a 45 H. P. and a 60 H. P. machine of this type.

Hitherto they have been built of 30, 36, 45, 60 and 80 effective H. P. The builder states that a 60 H. P. traction engine can draw a load of 20 tons on the level and from 12 to 15 tons on gradients of 8 to 10 per cent.

566 - Report on Clearing Land from Tree Stumps by Means of Steam Plough Engines. — RINGELMANN, M.: in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 111, Second Half-year, No. 4, Vol. 118, pp. 546-547. Paris, December 1912.

Communications on clearing land from tree stumps in the Belgian Congo, according to a report by E. Leplace published in the *Bulletin Agricole du Congo Belge*, Vol. III, No. 1.

567 - Certani's Subsoil Plough. — GAMPERT, E.: in *Journal d'Agriculture Pratique*, Year 77, Vol. I, No. 10, pp. 302-303. Paris, March 6, 1913.

The writer describes the subsoil plough built by M. Certani, civil engineer, which is now used with great success in the provinces of Bologna and of Ferrara (Italy). The problem that the inventor set himself, namely to apply to the side of the plough coulter an instrument intended to break up the bottom of the preceding furrow, has been advantageously solved. The object of this lateral application is to prevent the ploughed soil from being trampled by the draught animals. With a team of eight or ten oxen a depth of 20 to 22 inches by a breadth of 16 to 18 inches can easily be attained.

568 - **Tilling the Soil at One Operation.** — RUBARTH: in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 19, p. 231. Berlin, March 5, 1913.

The writer reports on some forms of his patented blade shares; after treating of the importance of this kind of implement, he gives some examples showing how the new system can be adopted in the best and simplest manner in various kinds of farms.

569 - **A New Machine for Extracting Sisal Hemp Fibre.** — *Der Tropenpflanzer*, Year 17, No. 3, pp. 152-154. Berlin, March 1913.

The firm F. Haake, of Berlin, exhibited before a number of managers of plantations belonging to companies interested in Sisal hemp the first "Roland" machine destined for German East Africa. For this purpose fresh Sisal agave leaves from Africa had been provided.

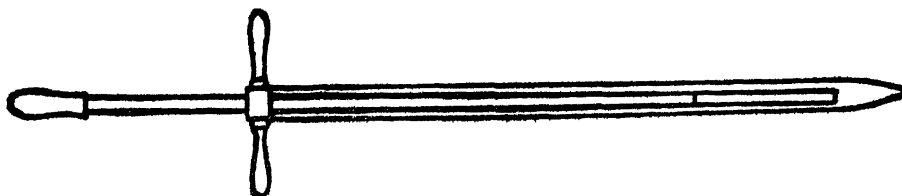
The general opinion of the experts after the trial of the machine was to the effect that it was distinguished by great simplicity and that the extraction of fibre was excellent.

The "Roland" machine is built of heavy U iron, and the intermediate gearing is mounted on the machine itself, which is besides fitted with ball-bearings of a special type, which allow it to run with extraordinary smoothness.

About 25 H. P. are required to drive it when working at its maximum.

570 - **New Sampler.** — MANDEKIC: in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 20, p. 241. Vienna, March 8, 1913.

This sampler (see figure) is about 3ft. 3 in. long and 1.4 inch in diameter and consists of a hollow cylinder provided with a longitudinal slit reaching almost to the tip, and a plunger. It is very useful for taking samples from a sack full of seeds, such as clover, cereals, grass and the like. The sampler with the plunger in it is thrust down to the bottom



of the sack containing the seed to be sampled. Then the plunger is slowly drawn out and the seeds fall through the slit into the hollow of the sampler. When this is full it is drawn out and its contents emptied through its upper opening.

This sampler is especially adapted for the examination of clover, as about a pound and a half of seeds can be taken out at one operation, thus saving much time. Another advantage consists in the plunger re-

maining movable notwithstanding the entrance of the seed so that no choking up of the slit is to be feared.

The sampler is to be had at the Royal Seed Control Station at Krizevci (Croatia).

- 571 - The "May" Milking Machine. — *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 16, p. 187. Vienna, February 22, 1913.

This patent milking machine is remarkable for the great simplicity of its construction. One person, using two of these machines, can milk from 24 to 34 cows in an hour. The sole agents for this machine, in Austria and Germany, are Messrs. P. Lübke of Breslau.

- 572 - The "Unfehlbar" Automatic Milk Measurer. — *Oesterreichische Molkerzeitung*, Year XV, No. 5, pp. 69-71. Vienna, March 1, 1913.

This article contains an illustration and a description of the above-mentioned apparatus, which was patented in Germany as No. 222,478.

- 573 - A New Rapid Milk Boiler with Cooling Apparatus for Continuous Work. — AUERBACH, N. in *Zeitschrift für Fleisch- und Milchhygiene*, Year XXIII, Part 12, pp. 270-273. Berlin, March 15, 1913.

From the researches of hygienists on raw and boiled milk the superiority of the latter appears to be proved. The writer describes the construction and working of a milk heater, which is provided with a device for automatically shutting off the supply of milk when the temperature sinks below a certain point. A heater capable of heating 53 gallons of milk per hour costs £34 6s. The heating can be done by gas, steam or electricity.

BUILDING-  
CONSTRUCTION

- 574 - A Handy Sheep Dip. — *The Pastoralist's Review*, Vol. XXIII, No. 2, p. 164. Melbourne, February 15, 1913.

The sheep dip represented in the diagram has all the advantages of a long swim bath at a very reduced cost. The sheep swim back and come under the control of the man who is penning up before dipping them. When the draining pens are full, he has only to come through the fence and open the gates (Fig. 1).

In Fig. 2, half a dozen sheep are placed in the decoy pen (b) first; the others then are forced up the inclined race (c); on reaching the slide (d), they lose their footing, and glide into the bath. Between the posts on either side of the slide, there is a square curtain of raw ox-hide hung to hide the fall and catch the splash.

The slide is made of smooth, well-oiled, well-planed boards, so as to avoid the slightest foothold for the slipping animal. On leaving the bath (e), the sheep first reach the draining pens (f), and finally the drying yard (g).

- 575 - Automatic Drinking Troughs. — GODBILLE, P. Installation hygiénique de l'étable. — *L'Hygiène de la Vlande et du Lait*, Year 7, No. 2, pp. 62-70. Paris, February 10, 1913.

After describing some systems of watering live stock, which owing to their defects, have not been largely adopted in practice, the writer des-



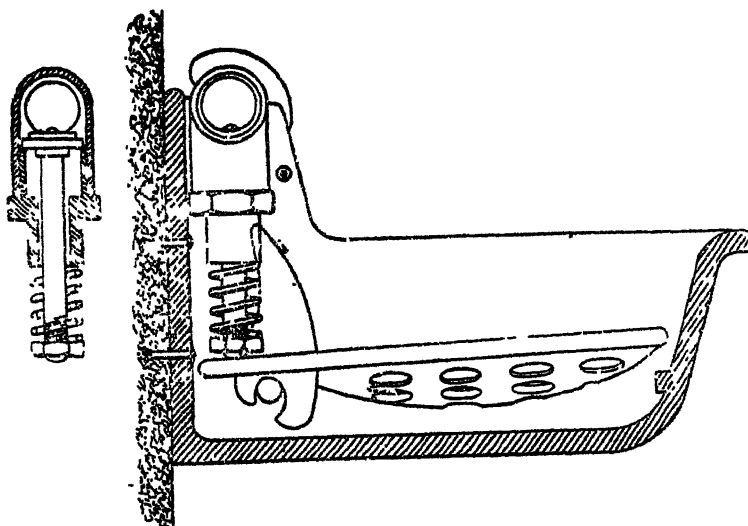






cribes the Manfroid-Bauduin system, which is widely spread in the North of France, in Paris and in Belgium, and which from both the hygienic and the economic point of view, has given the best results.

As the annexed figure shows, this trough, which is fed directly from



the water pipes or from a cistern, consists essentially of the drinking basin, in which a movable plate is so placed as to work a valve. The animal presses the plate with its muzzle and drinks at the same time. When pressure on the plate ceases the valve closes by itself by the pressure of the water and by the action of a spring.

**576 - Basket-Work Ventilators.** — *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 21, p. 255. Vienna, March 12, 1913.

Farmers are often obliged by bad weather to store hay, straw, cereals or other produce before it is dry enough. Spreading in thin layers, making use of the upper and best ventilated storerooms of the farm, and similar measures may to a certain extent save the produce for a short time from destruction, but the limited amount of space is inadequate to cope with large quantities of produce. Matters however are very different and the available space can be utilized to a much greater extent when ventilator tubes offering an easy passage to air are used, such as those that H. Schmale of Berlin has placed on the market. They are made of a durable permeable osier work and when placed at distances of two or three feet from each other in heaps of cereals or of other similar produce they ensure a steady circulation of air, which considerably diminishes the danger of heating and moulding. These ventilators are laid cross-wise in stacks. They are about 3ft. 8in. long; those made for stacks are 6 ½ inches in diameter and those for cereals 10 inches. They cost 17s 6d to 18s. 6d. per dozen.

## RURAL ECONOMICS.

RURAL  
ECONOMICS

577 - Types of Farming in relation to Distance from Market. — BRINKMANN  
in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 6, pp. 185-213. Stuttgart,  
March 15, 1913.

The very varied systems of farming depend upon the action of two opposite groups of forces: on the one hand those which lead to the specialisation of production, and which render a particular locality suitable for certain products and another locality for other products (differentiation forces), and on the other hand those which tend to unite several branches of production into a whole (integrating forces). This latter tendency is due chiefly to the three following causes: the first of which is the regular distribution of work throughout the year for the economy of human labour, of other power and of capital. This tendency leads to the distribution of the acreage of the farm among a greater or smaller number of different cultures for which the operations of sowing, interculture and harvest fall in different times.

Similar to the well known law of diminishing returns, the law of increasing expenses may be mentioned as coming into play with the extension given, beyond a certain limit, to any one crop, because instead of the union of several crops, the utilization of the soil tends to become a one-sided specialization. On the other hand the more appropriate the choice of the group of crops to be grown, in respect to the means of production employed, the lower will be the expenses per unit of surface and of production. In this connection the reciprocal complement that spring wheat and winter wheat are to each other is specially important. The same connection exists between hoed crops and forage plants, between cereals and oil seeds. The regular distribution of work throughout the year rises in importance with the intensity of farming, with the compactness of the soil and with the relatively unfavourable position of the farm respecting the market.

The second cause which leads to adopting a combination of several crops as against specializing, is the need of utilizing in the best possible manner the conditions of fertility of the soil. The various crops which enter into the rotation must complement each other in their needs for growth, as well as in the influence they exert on the fertility of the soil, so as to have as far as possible a natural reciprocal reintegration of the fertility of the soil.

It follows thus that in the choice of the crops to be grown together, as well as in determining the area and place to be given to each in the rotation, the farmer must seek to combine the advantages which derive from one grouping of crops rather than another in its bearing upon the conservation of the fertility of the soil, together with those connected with the best utilization of the means of production employed. The more favourable the natural and economic conditions of a farm are, the more important for the combination of several crops does the principle of

rotation become in comparison to the principle of the distribution of the work throughout the year.

The economy of manures in the farm is an important factor for the preservation of the fertility of the soil in respect to a given combination of crops, because upon this, in its turn, depend the rational production and utilization of the manure produced in the farm itself. In the first place the production and conservation of nitrogen and of the organic matter in the soil must be considered, and this leads to alternation of hoed crops, cereals and other crops that consume greater quantities of nitrogen with those that accumulate this element, either forage plants or plants to be used as green manure.

The third cause, lastly, is the necessity of providing for the upkeep of the means of working the farm, especially of the productive stock, which in most farms is indispensable for the production of manure and for the utilization of certain products of the soil. Most frequently, however, for physiological and dietetical reasons, it is not possible to have rational feeding without adopting mixed food rations, the needs of which must be considered in the choice of the group of crops to be grown; and as forage must be provided throughout the year, such crops must be grown as completely meet requirements during the whole time. Thus, partly for physiological reasons connected with feeding requirements and partly for agricultural and technical reasons, no individual crop can be considered independently of the bond which unites it to the other crops in respect of its utilization. Only pasture can in exceptional cases maintain its independence; all other crops cereals, meadows, clover, hoed forage plants, etc., must be considered as dependent upon complementary crops in the interest of the best utilization of their products.

The disturbance of the equilibrium of these three factors of a given system of farming by extending the relative area given to one crop at the expense of the others injures in three ways the economy of the whole farm: 1. The cost of production per unit of area and per unit of product increases in consequence of the increase, for one of the elements of the combination, of the cost of labour. 2. The returns diminish in consequence of the incomplete utilization of the fertility of the soil. 3. The real money value of the product diminishes on account of the difficulties encountered in the suitable working up and marketing of the same.

In opposition to the forces and factors which lead to the combination of crops and to the system of agricultural economy connected with it, other factors are at work in the direction of specializing crops and production, which point out in their turn the localities most suitable to a given crop. In the competition which takes place for the choice of such a locality, a given branch of farming may all the more easily be limited or suppressed, the smaller the advantages of its introduction into the combination of crops in respect of the utilization of the means of production, of the equilibrium of the fertility of the soil, and of the best

realization of its value; or it may all the more easily be extended the less it is connected with the other branches of the system of farming.

Among the factors which concur in determining a given combination of crops in a given locality (in contradistinction to those which cause only a temporary variation in the combination), the conditions of carriage and sale are of the most vital importance because the place of production is attracted towards the markets by the possibility of saving in the cost of carriage and of marketing (concentric belts of Thünen). In this respect, hitherto only the ratio between the cost of carriage and the market prices of farm produce were taken into consideration; and the conclusion had been drawn that in a good position respecting the market it is the low priced products which cannot stand high transport expenses, that prevail, while in unfavourable conditions the prevalence is with high priced wares. But in this manner the causes of the differences in the cost of transport are not explained, but simply accepted as a given fact.

In order to understand the influence which sale conditions exert upon the locality of production, account must be taken of the variable ratio which exists among the different factors of the cost of production, and between them and the costs of carriage and of sale on the market, for a given unit of saleable products; and secondly of the variable area necessary for their production.

Among the factors determining the choice of the locality of production, the first place is occupied by the elements of cost which vary with the favourable position as regards the market and with the various products. Among these the costs of carriage and sale act centripetally and partly centrifugally: that is to say the elements of cost which are due to labour and to the agricultural part of the working capital act centrifugally, while the expenses of purchase deriving from the commercial part of the working capital act centripetally (1) because the former diminishes and the latter increases in price according as the relative position of the farm is less favourable. In proportion as the relative position of a given production improves respecting the market, the saving in the cost of carriage, of sale on the market and of the commercial working capital is partly absorbed by the higher cost of labour and of the agricultural part of the working capital, and this all the more where these latter factors play a greater part in the total production, both absolutely and relatively.

The final influence which the market exerts on the place of production of the various products may be translated into figures by adding the differences of the total costs of production which would be obtained per unit of product for sale by diminishing the distance between the farm

(1) The agricultural part of the working capital is that which may be produced in the farm itself (forage, litter, stable manure), the commercial part must be bought (oil cakes, chemical manures).

and the market by a given distance. The items of saving would represent the positive element, the increase of expenses the negative element. The amount of this sum depends upon the ratio of these items to each other. It represents the effective saving obtained after deducting from the gross savings the increase of outlay, and may be considered as the index of saving per unit of saleable produce. It may then be said that, other conditions being equal, the product which has the maximum savings index occupies in respect to the market the most favourable locality of production.

Thünen, who has made some comparisons of the kind, has arrived at the following general law: With equal production per unit of area, the crop which requires the greatest expenses must be located at the greatest distance from the town. Nevertheless, for the above mentioned reasons, this law is not always absolutely true.

The farmer endeavours to secure the maximum profit, not only per unit of product taken to market, but especially per unit of cultivated area, or in other words the maximum profit on the land; this is determined not only by the gain per unit of produce taken to market, but also by the number of these units which may be obtained from a given area. Thus the adoption of the systems of agricultural economy from the point of view of the sale conditions of the products, of the cost of carriage and sale on the market, is after all determined not by the saving of expenses per unit of product but by the gain per unit of area. This gain may be called the index of the profit on the land; it is obtained by multiplying the profit index per unit of saleable product by the number of units furnished by one unit of cultivated area.

It is only for those products which have the same requirements as to the extent of area necessary to produce the same unit, that the index of saving on cost of carriage and sale prevails practically over the index of profit on the land, especially when the first index is influenced by the transport rates.

The writer then shows, by means of an example with figures, that a series of products arranged according to the decreasing order of their values coincides with the series obtained by arranging them according to the increasing profit on the land. This confirms the justness of the empirical law according to which, with equal cost of carriage and of sale and with equal proportion between the various groups of the cost of production, the least valuable products are raised in the neighbourhoods of the markets, and vice versa, with the only difference that until now the positions of cause and effect had been inverted in the explanation of the causes which determine the locality of production: the difference in value was considered as the cause of the fact and consequently of the system of farming, whilst in reality the causes lie deeper and the difference in value must be partly considered as an effect of the situation of the place of production.

¶ In studying the facts of the adaptation of the combination of crops to the conditions of sale, from the point of view of the least cost of

delivering the products on the market, one comes to the same conclusion; that the index of the profit on the land is decisive, because as every product must compete with the others for the best locality of production, the profit on the land deriving from these products forms part in its turn of the total cost of production of the product in question and weighs more or less heavily upon it.

Considering the fact from a purely theoretical standpoint, a product which has a negative index of savings, even without being charged with the profit on the land, may be delivered cheaper from districts further from the markets than from those situated nearer.

The writer does not believe, however, that this is the case in the instance quoted by Thünen, namely of butter making; but he admits that it may happen for other products, certainly for cotton and probably for flax.

As for the problem of the adaptation of the combination of crops to the conditions of sale, from the point of view of quantity, the necessity of a combination of crops prevents the formation of belts in the strict sense of a real specialisation or distribution of production; it does not, however, exclude the quantitative variation of the branches of production under the influence of the local conditions of sale. The more favourable these conditions are, through the relative position of the farm to the markets, the greater is the number of saleable products which may form part of the combination of crops in order to suit the requirements of a multiplicity of production.

Considering then the ratio existing between products rendered marketable by means of the various agricultural industries and the products not rendered marketable in this way, from the point of view of the relative position to the markets, it is clearly seen that the more unfavourable this position is, the greater the need for the farm to render its products marketable by means of industrial processes so as to reduce in general the weight of the products to be carried to the market, which amounts from the economical point of view to a diminution of the index of the profit on the land. Besides, the products not rendered marketable by means of agricultural industries generally show a higher index of expense for manures; they therefore tend to localize in the neighbourhood of the markets, that is to say where the fertilizing materials taken from the soil can be returned to it more cheaply.

**578 — The Sizes of Agricultural Holdings in England and Wales in 1911 and 1912.** — *Agricultural Holdings. — Board of Agriculture and Fisheries, Agricultural Statistics, 1912, Vol. XLVII, Part I, pp. 6-8. London, 1913.*

The number of agricultural holdings — i. e. of separate occupations of agricultural land exceeding one acre in extent — in 1913 was in England 374 809 and in Wales 61 077, together 435 886, being an increase of 576 over 1911. The increase was due to holdings of from 5 to 300 acres, which increased by 1301, while small holdings of less

than 5 acres and large occupations of over 300 acres decreased in number by 550 and 175 respectively.

Since 1905, 628 of the larger farms (of over 300 acres) have disappeared, being for the most part subdivided into smaller holdings. During the same period, holdings of 50 to 300 acres have increased by 1088, holdings of 5 to 50 acres by 2229 and those of 1 to 5 acres by 624. The number of persons occupying land in England and Wales (so far as these returns may be regarded as representing separate occupations) has increased in the course of seven years by 3313. It is to be remembered that during that period, the farmed area has diminished by 231000 acres, involving of necessity the extinction of a large number of holdings. A net increase of the number of holdings into which the dwindling agricultural land is divided is consequently the more significant.

Large farms, nevertheless, still occupy a very considerable portion of the land of the country. About 25 per cent. of the total farmed area is divided into farms exceeding 300 acres, while nearly 60 per cent. is taken up by medium farms of 50 to 300 acres. Small holdings of 50 acres and under, though forming about two-thirds of the total number of the occupations, account for little more than 15 per cent. of the agricultural land of the country.

The difference between England and Wales as regards the size of the holdings is considerable. In Wiltshire 55 per cent., in Northumberland 49 per cent., and in Berkshire, Cambridge, Dorset and Hampshire about 47 per cent. of the agricultural land is farmed in holdings of over 300 acres. On the other hand, in the whole of Wales (with the exception of Radnor), in Cheshire, Cornwall, Derbyshire, Lancashire and Monmouth not more than 10 per cent., and in Lancashire and half the Welsh counties less than 5 per cent. of the land is taken up by "large" farms.

Of the 374809 holdings in England in 1912, there were 81884 (21.85 %) of from 1 to 5 acres, 168038 (44.83 %) of from 5 to 50 acres, 110657 (29.52 %) of from 50 to 300 acres and 14230 (3.8 %) of over 300 acres; while in Wales, the numbers were respectively: 10314 (16.89 %), 32484 (53.18 %), 17937 (29.37 %) and 342 (0.56 %).

579 - **Determining the Price of Sugar Beets in France.** - **PLUCHET, E.:** in *La Vie agricole et rurale*, Year 2, No. 16, pp. 437-439. Paris, March 22, 1913.

If the sugar manufacturer wishes to ensure a sufficient supply of raw material for the autumn, he is obliged to purchase the sugar beets in February or March, i.e. two months before the crop is sown. The amount he obtains depends upon the yield per surface unit of the land. If 30000 metric tons are required annually to supply the sugar-factory, the owner tries to purchase the crop of 1000 hectares which are estimated as producing an average of 12 English tons per acre. This contract is very advantageous to the farmer, who thereby ensures a market for his crop in a good or a bad year. On the other hand, the sugar-

manufacturer has no guarantee as to the amount of the consignment; for the yield may be 25 per cent. above or below the average, so that instead of 30 000 tons he may get only 22 500 or as much as 37 500 tons. In the first case, the manufacturing cost per ton of sugar beets will be much higher; in the second, the unusual prolongation of the working season necessitates unusually long storage of the beets, with a consequent loss of sugar.

In order to reduce this risk to a minimum, the writer suggests that the following principal method of purchasing the raw material should be adopted: The farmer shall undertake, either to deliver a certain fraction of the average estimated crop of the area under beets (e.g.  $\frac{5}{6}$  of the yield of 10 hectares at 30 tons per hectare, i.e. 250 tons), with the reservation that he shall have the right of the disposal of any surplus; or to supply the whole estimated amount (300 tons) plus or minus 10 or 15 per cent.

The price of sugar beets depends upon their quality and upon the price of sugar quoted on the Paris Bourse at the time of purchase.

The quality is estimated by the density of the juice, which is ascertained when the consignment is made. The price of sugar beets per ton is fixed for roots of 1.070 density, or as it is usually termed, 7° of density. For every tenth of a degree above or below 7°, the price rises or falls by a sum varying from 30 to 50 centimes according to arrangement. In the writer's opinion, it would be far juster to estimate the price of the beets from the actual sugar content, rather than from the density of the juice.

The second factor which determines the price is the difference between the price per quintal quoted for sugar No. 3 (white sugar) by the Paris Bourse for the time of extraction, at the date when the manufacturer makes his contract with the grower, and that of a ton of sugar beets of 7° density delivered at the factory. This difference represents the margin for manufacturing costs and profit, and cannot be less than 6 fr. (or 5 fr. after subtracting carriage and brokerage).

The sugar manufacturer endeavours to insure himself against loss by taking contracts for sugar based upon the contract he has already made for the purchase of beets; but owing to the present method of buying beets, which depends upon the yield of the surface unit, he may lose heavily, as the crop is subject to great variations. Thus in the bad year of 1911, many sugar-manufacturers, in order to fulfil their contracts, were obliged to purchase larger or small quantities of sugar at considerably higher prices, although they had prudently only engaged themselves to deliver from 80 to 90 per cent. of the amount of sugar which they expected to obtain from their contracts for the purchase of beets.

The writer recommends the adoption of the following method of fixing the price of sugar beets: The buyer and seller shall fix a difference between the price of beets and that of sugar, which will leave a moderate margin of profit to the manufacturer. The seller shall have the right to determine the date at which the price of the beets shall be

settled, this depending upon the prices of sugar quoted on the Bourse. Should the price of sugar quoted by the Paris Bourse in February and March (the date of the sale-contract) not seem sufficiently high to the farmer, he shall have the right, until September 30, to take the prices quoted for sugar by the Paris Bourse at any date he likes as the basis on which to determine the price of beets for the working season of the sugar factories (October, November, December). If he prefers to fix the price of the beets according to the sugar market at periods other than that of the manufacturing (4-month periods beginning January, March or May), he has only to inform the buyer by letter, and the price will be fixed by the quotation for sugar on the Paris Bourse the day following that on which his letter is received at the factory. Should this period chosen by the seller be the period of manufacture, the price of one ton of beets of 7° density is that of one quintal of sugar over the three-month period beginning October, less the difference agreed upon; but should the grower have chosen a later period, the amount to be subtracted is increased by 25 centimes for every month, in order to compensate the manufacturer for the increased expense of storing, insurance, etc.

Example: X, a grower, sells in March to Y, a manufacturer, 400 tons of sugar beets on the basis of 7° density and that the fixed sum to be subtracted from the sugar price is 6 fr. The Bourse quotes No. 3 sugar at this date as 29 fr. per quintal for the quarter beginning October; this would give 23 fr. per ton of beets, which X considers too low. At a given date between March and September 30, the price for the quarter beginning October is 31 fr.; X informs Y by letter that he wishes to settle the price, which is effected by adopting the price quoted by the Bourse the day after the receipt of the letter, for the quarter beginning October. If the price of sugar does not rise by September 30, X waits still longer, and after a certain time, the price of sugar for the 4-months beginning May is quoted at 34 fr. X informs the manufacturer, and the price of the beets is settled at 34 —  $(6 + 8 \times 0.25 \text{ fr.}) = 26 \text{ fr.}$

It would be reasonable to arrange that if the price of sugar should rise above a certain fixed limit, e.g. 35 fr., the surplus should be divided between the grower and the manufacturer. The writer is of opinion that the adoption of this method would be to the advantage of both grower and manufacturer.

580.—**Ten Years' Returns of a Cherry Orchard in Holland** (1). — *Rentabiliteitsproef met een kerseboomgaard.* — *Departement van Landbouw, Nijverheid en Handel, Verslagen en Mededeelingen van de Directie van den Landbouw*, No. 1, pp. 57-59. The Hague, 1913.

In 1900, a cherry orchard of  $\frac{1}{2}$  hectare (about  $1\frac{1}{4}$  acre) was laid out at Uden in Holland; standard trees of two varieties (Black and Spanish) were planted 26 ft. apart. The cost of making the orchard was £28 18s 6d

(1) See No. 1639, B. Dec. 1912.

(Ed.).

and the value of the land was £ 14 17s 6d, so that the whole capital expended amounted to £ 43 16s. Potatoes and kohlrabi were grown every year as intercalary crops; the net profit of these was about 16s 6d. The receipts and expenditure for the year 1900 were as follows:

<i>Expenditure</i>	<i>£ s d</i>	<i>Receipts.</i>	<i>£ s d</i>
Interest on capital laid out, at 1% . . . . .	1 15 0	Net profit of potatoes and turnips. . . . .	16 6
Amortisation of outlay, at 2% . . . . .	11 6		
Cost of manuring . . . . .	4 2 9		
Wages of labourers . . . . .	1 13 8		
	<u>£ 8 2 6</u>		

There was thus a loss of £ 7 6s, or £ 5 18s 3d per acre. In 1901, this loss was increased by 6 per cent. (8s 9d) by the sums paid for interest and depreciation; in 1902 by the extra expenditure of 1900 and 1901, so that it amounted to 8s 9d + 9s 3d = 18s; in 1903 to 18s + 9s 9d = 27s 9d; in 1904 to 27s 9d + 10s 6d = £ 1 18s 3d; and in 1905 to £ 1 18s 3d + 11s = £ 2 9s 3d.

The cherry trees bore for the first time in 1906; from that date until 1911 the balance was as follows:

## 1906.

<i>Expenditure</i>	<i>£ s d</i>	<i>Receipts.</i>	<i>£ s d</i>
Expense as in 1900 . . . . .	8 2 6	Potatoes and kohlrabi . . . . .	16 6
Interest on loss in 1905 . . . . .	2 9 3	Cherries . . . . .	3 6 0
Total . . . . .	10 11 9	Total . . . . .	<u>4 2 6</u>
Subtract . . . . .	4 2 6		
Loss . . . . .	<u>6 9 3</u>		
Loss per acre £ 5 4s 8d.			

## 1907.

<i>Expenditure.</i>	<i>£ s d</i>	<i>Receipts.</i>	<i>£ s d</i>
Expense as in 1906 . . . . .	10 11 9	Potatoes and kohlrabi . . . . .	16 6
Interest on loss in 1906 . . . . .	7 9	Cherries . . . . .	7 8 9
Total . . . . .	10 19 6	Total . . . . .	<u>8 5 3</u>
Subtract . . . . .	8 5 3		
Loss . . . . .	<u>2 14 3</u>		
Or per acre £ 2 4s.			

1908.

<i>Expenditure.</i>			<i>Receipts.</i>		
	£	s d		£	s d
Expenses as in 1907 . . . . .	10	19 6	Potatoes and kohl-rabi . . . . .	16	6
Interest on loan in 1907 . . . . .	3	3	Cherries . . . . .	10	15 0
Total . . . . .	11	2 9	Total . . . . .	11	11 6
			Subtract . . . . .	11	2 9
			Net profit . . . . .	0	8 9
			Or 7s 1d per acre.		

1909.

<i>Expenditure.</i>			<i>Receipts.</i>		
	£	s d		£	s d
As in 1908 . . . . .	11	2 9	Potatoes and kohl-rabi . . . . .	16	6
			Cherries . . . . .	11	11 6
			Total . . . . .	12	8 0
			Subtract . . . . .	11	2 9
			Net profit . . . . .	1	5 3
			Or 20s 6d per acre.		

1910.

<i>Expenditure.</i>			<i>Receipts.</i>		
	£	s d		£	s d
As in 1909 . . . . .	11	2 9	Potatoes and kohl-rabi . . . . .	16	6
			Cherries . . . . .	16	10 9
			Total . . . . .	17	7 3
			Subtract . . . . .	11	2 9
			Net profit . . . . .	6	4 6
			Or £ 5 0s 10d per acre.		

1911.

<i>Expenditure.</i>			<i>Receipts.</i>		
	£	s d		£	s d
As in 1910 . . . . .	11	2 9	Potatoes and kohl-rabi . . . . .	16	6
			Cherries . . . . .	20	13 3
			Total . . . . .	21	9 9
			Subtract . . . . .	11	2 9
			Net profit . . . . .	10	7 0
			Or £ 8 7s 6d per acre.		

- 581 - **Scheme of Prizes for Best Managed Small Holdings. Suggestions to Competitors.** — *Board of Agriculture for Scotland, Leaflet No 6, 1 pp* Edinburgh, February 1913.

The Board of Agriculture for Scotland started in 1912 a Scheme of Prizes for small Landholders, whose holdings were best kept and managed. These small landholders include all occupiers of holdings rented at not more than £50, or rented at more than £50, but not exceeding 50 acres in extent, exclusive of common grazings.

The following points will receive the attention of the judges:

- 1) The conditions of the house and premises, including, stables, byres and poultry houses.
- 2) The number and quality of the stock; the croft should be sufficiently stocked and attention paid to pig-rearing.
- 3) Cropping and cultivation; the extent of the waste land, the condition of the crops, rotation, drainage, the increased size and improved arrangements of the fields, and the hedges and shelter-belts planted.

- 582 - **Dairying versus Fattening.** — BONDY, AUGUST: in *Wiener landwirtschaftliche Zeitung*, Year 63, No. 19, pp 231-232. Vienna, March 5, 1913.

The writer speaks of the reasons governing the choice of either of these industries and then gives diagrams and tables showing the results for 10 years (1902-1912) obtained in the farm under his direction, where both dairy cows and cattle for fattening were kept. According to these data, the former branch of the industry had been remunerative during the ten years in question, while the latter had been a loss.

- 583 - **Rotations in the Middle West of the United States.** — SNYDER, A. H. *The How and Why of Crop Rotation.* — *Successful Farming*, Vol. XII, No. 2, pp 10-11. Des Moines, Iowa, February 1913.

After setting forth the chief rules to be observed in selecting a rotation, the writer gives some rotations suitable for the farms of the Middle West States and describes, by means of diagrams, the necessary division of the fields according to whether the farmer is chiefly interested in raising cereal crops, or in cattle-breeding.

## AGRICULTURAL INDUSTRIES

- 584 - **The Effect of Freezing upon the Composition of Milk.** — MAI, C. in *Milch-wirtschaftliches Zentralblatt*, Year 42, Part 5, pp 129-131. Hannover, March 1, 1913.

In order to ascertain the effect of frost upon milk, the writer carried out five experiments. The milk was, in every case, placed in closed zinc cans and put in the open to freeze.

I. — Ten litres of milk were exposed for 15 hours to a temperature of - 3°C. (26.6°F.). When the vessel was opened, the milk appeared to have undergone no alteration; a thick layer of cream had risen and the milk was liquid. Only when it was poured through a sieve, could it be seen that

some crystals up to 3 inches in length were floating in the milk. The total weight of these crystals was 50 gr.; the fat content was 2.1 per cent, and the refractive index 26.8 according to the scale of the Zeiss dipping refractometer. The composition of the original milk was : specific gravity 1.0324, refractive index 39, fat 3.4 per cent., solids not fat 5.05 per cent.

A can of water, placed near the milk, was frozen nearly solid in 15 hours.

II. — A can containing 20 litres was filled with milk of the following composition : specific gravity 1.0315, refractive index 39.2, fat 3.5 per cent., solids not fat 8.84 per cent. After the can had remained for a day and two nights in a temperature of  $-10^{\circ}\text{C}$ . ( $14^{\circ}\text{F}$ .) the appearance of the contents was as follows : above lay a mass of somewhat loose, frothy, flaky ice weighing 1 kg.; in the middle were 3 or 4 litres of liquid milk, while the bottom and sides of the vessel were covered with a thick coating of solid ice. The following figures were obtained :

	Specific weight	Refractive index	Fat per cent.	Solids not fat per cent.
Upper loose ice. . .	1.0175	34	7.7	6.3
Liquid portion . . .	1.0450	50	2.5	11.87

The whole contents were again replaced in the receptacle, which was then shut up in a room at  $+18^{\circ}\text{C}$ . ( $64.4^{\circ}\text{F}$ .) until the milk again became completely liquid ; this took two days and a night, while the water in another vessel, which had been frozen solid, thawed completely in scarcely half the time. The thawed milk had the following composition : specific gravity 1.0316, refractive index 39.9, fat 3.5 per cent, solids not fat 8.85 per cent.

III. — Ten litres of fresh milk were exposed to a temperature of  $-6^{\circ}\text{C}$ . ( $21.2^{\circ}\text{F}$ .) After 14 hours, the writer observed that a crust of ice as thick as a finger had formed on the sides of the vessel; the can was closed and exposed for another 24 hours to the same temperature. The results were : the upper portion was frozen into frothy flaky ice with a weight of about  $\frac{3}{4}$  kg.; the portion which had remained liquid, about 4 litres, was passed through a sieve, and the ice crust which was adhering to the walls was thawed and added to the rest of the milk. The following figures were obtained :

	Specific gravity	Refractive index	Fat per cent.	Solids per cent.	Degree of acidity
Original milk . . . . .	1.0317	38.5	3.4	8.87	6.5
Upper loose ice . . . . .	1.0233	37.5	11.1	8.57	—
Ice adhering to sides. . . . .	1.0165	28.0	3.2	4.92	—
Portion which had remained liquid . . . . .	1.0534	52.2	2.0	13.85	—
Again combined . . . . .	1.0321	38.5	3.3	8.95	7.3

IV. — Ten litres of milk were exposed for 16 hours to a temperature of  $-8^{\circ}\text{C}$ . ( $17.6^{\circ}\text{F}$ .); the contents of the vessel had a similar appearance to that in experiment III; the liquid portion, which was passed through a sieve, contained translucent crystals. After the component parts had been analysed they were again combined. The results are given in the following table :

	Specific gravity	Refractive index	Fat per cent.	Solids per cent.	Degree of acidity
Original milk . . . . .	1.0312	38.7	3.6	8.78	7.1
Crystals . . . . .	—	35.3	3.0	—	—
Portion which had remained liquid . . . . .	1.0352	41.3	2.9	9.65	8.0
Ice adhering to sides . . . . .	1.0172	30.4	5.8	5.75	3.8
Recombined . . . . .	1.0320	38.7	3.5	8.96	7.4

V. — In order to observe the results in the case of milk which had been quickly cooled to a low temperature, the writer cooled 10 litres to  $0^{\circ}\text{C}$ . ( $32^{\circ}\text{F}$ .) shook it thoroughly and then left it for 30 hours in a temperature of from  $-15^{\circ}$  to  $-18^{\circ}\text{C}$ . ( $5^{\circ}$  to  $-0.4^{\circ}\text{F}$ .). A small portion of the milk was taken for the purpose of observing it when turning sour; this was kept in an ice-chamber, but unfrozen. The contents of the vessel presented the same appearance: after separation of the parts, the whole was left standing for three days at a temperature of from  $+3$  to  $4^{\circ}\text{C}$ . ( $36.4^{\circ}$  to  $39.2^{\circ}\text{F}$ .), and then again examined. The following table gives the results of this experiment :

	Specific gravity	Refractive index	Fat per cent.	Solids per cent.	Degree of acidity
Original milk . . . . .	1.0318	38.6	3.7	8.94	6.2
Upper loose ice . . . . .	1.0256	40.2	11.6	9.30	8.2
Portion which remained liquid . . . . .	1.0534	53.5	3.3	14.17	11.0
Ice adhering to sides . . . . .	1.0201	30.1	2.9	5.75	3.8
Recombined . . . . .	1.0320	38.7	3.6	8.97	7.2
Milk in refrigerator . . . . .	—	38.6	—	—	7.0

The experiments further showed that freezing does not perceptibly alter the smell and taste of milk, but when milk has been frozen, on thawing it turns sour more quickly.

On the strength of these experiments, the writer advises caution in taking samples of milk in winter and says that milk which has been frozen should be sold at a low temperature, but not before it has completely thawed.

585 - **The Composition of Ewes' Milk in Hungary: Analytical Results from the Municipal Laboratory of Agricultural Chemistry at Keeskemét.** — BIRÓ, GUSZTÁV: in *Kísérleti és Közl.-mennyek*, Year XVI, No. 1, pp. 89-96. Budapest, January-February 1913.

The milk yield of the ewes belonging to the Racka and Cigája breeds at present reared on the great plain of Hungary being relatively small, the Royal Hungarian Agricultural School at Keeskemét is trying whether this can be increased by crossing them with the Frisian breed.

The following table gives the average of the analyses of the milk of 25 ewes of the Racka X Frisian cross, and 25 of the Cigája X Frisian cross. Milking was done three times a day: morning, noon and evening.

	Specific gravity of the milk	Specific gravity of the serum	Specific gravity of the dry matter	Total solids	Fats	Solids not fat	Ash
				per cent.	per cent.	per cent.	per cent.
April . . . . .	1.0370	1.0338	1.2563	17.57	6.34	11.23	0.78
May . . . . .	1.0374	1.0335	1.2428	18.40	6.84	11.78	0.80
June . . . . .	1.0370	1.0327	1.2349	19.17	7.41	11.75	0.72
July . . . . .	1.0372	1.0328	1.2283	19.56	7.63	11.97	0.77
August . . . . .	1.0364	1.0330	1.2087	20.63	9.02	11.55	0.82

586 - **The Lisbon Milk Supply.** — NOGUEIRA, J. V. PAULA: in *Boletim da Associação Central da Agricultura Portuguesa*, Second Series, Vol II, No. 1, pp. 24-30. Lisbon, January 1913.

Critical description of the hygienic conditions of the milk trade in Lisbon, followed by the proposal of a municipal control of such trade, as voted by the « Sociedade Portuguesa de Medicina Veterinaria ». In the proposal it is urged that the milch cow stables within the city be suppressed; that the milch animals should not be allowed to be driven about the streets, that the cows whose milk is intended for sale in the city should be submitted to sanitary examination, as well as the milkers and milk salesmen, and that the milk sold in the city be from time to time submitted to chemical and bacteriological examination.

The milk shops are to sell only whole milk (with at least 3 per cent. of butter fat) or only skimmed milk; and that only three grades

of milk be allowed for sale: certified milk, that is supplied by animals that have undergone the tuberculin test and that are properly kept, such milk to be milked and kept with special hygienic precautions; common milk; pasteurized milk.

- 587 - **The Estimation of the Efficiency of Commercial Rennet.** — VAN DAM: in *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstation*, No. 12, pp. 5-33. The Hague, 1912.

An account of experiments with Devarda's method for determining the coagulating property of commercial rennet, which the writer shows to be unsatisfactory. A new method, devised in the Hoorn laboratory, is subsequently described and recommended.

- 588 - **Study on the Technique of the Manufacture of Parmesan Cheese, Lodi Type.** — SAMARANI, CARLO: in *Bollettino del Ministero di Agricoltura, Industria e Commercio, Relazioni e studi scientifici e tecnici*, Year XI, Series C., Part 11-12, pp. 39-42. Rome, 1912.

This is a chemical and bacteriological investigation on the various phases of the manufacture of Lodi cheese and a determination of the most favourable temperature conditions and bacterial content in each of them. The work was carried out in the laboratory of bacteriology of the Royal Experiment Station for Cheese-making.

Starting from the results obtained, the writer has devised a method of cheese-making based on the following processes: 1) the milk is skimmed cold, and flows into the boiler with the same degree of acidity that it has when freshly milked (about 4° of acidity Soxhlet); 2) introduction into the milk of a culture of lactic bacilli of the greatest fermentative energy in the proportion of 4 ½ cubic centimetres per gallon; 3) keeping the cheeses for 12 to 24 hours at a temperature of 37 to 40° C.

- 589 - **A Thread-Forming Lactic Acid Bacillus (*Bacillus casei filans*).** — GORINI: in *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 37, No. 1-3, pp. 1-3. Jena, March 8, 1913.

The description of a new thread-forming lactic acid bacterium, which was isolated 10 years ago by the writer from Grana cheese, and which has preserved its thread-forming property.

- 590 - **Reactions for Distinguishing Fresh Milk from Boiled Milk.** — BICKLE: in *Molkerei-Zeitung*, Year 23, No. 9, pp. 98-101. Berlin, March 1, 1913.

The writer tested the reactive properties of several guaiacum tinctures and guaiacum-guaiacol tinctures, and examined the effect of the addition of hydrogen peroxide, used as a preservative, upon the guaiacum reaction.

The experiments, which turned out in favour of the guaiacum-guaiacol tinctures, showed that the addition of a small amount of hydrogen peroxide slightly increases the reaction.

- 591 - **The Determination of the Fat Content of Cream by Dr. Köhler according to Du Roi-Hoffmeisters Rinsing Method.** — HOFFMEISTER: in *Oesterreichische Molkeri-Zeitung*, Year 20, No. 6, pp. 83-85. Vienna, March 15, 1913.

The writer draws attention to the defects of Gerber's dilution method for determining the fat content in cream, and then describes a modified method adopted by Dr Köhler (of Prenzlau), which differs from the former in the fact that the pipette in which the cream is measured, is rinsed with water from above. The writer considers this simpler and more exact method as the most suitable for introduction into general practical use. The manner in which it is carried out is explained by means of illustrations.

- 592 - **The Money Value of Skimmed Milk.** — KIRCHNER: in *Molkeri-Zeitung*, Year 23, No. 7, pp. 73-75; No. 8, pp. 87-88. Berlin, February 1913.

The writer estimates the feeding value of skimmed milk according to the most usual methods, and comes to the conclusion that, in estimating the value of whole milk in Germany, at least 1  $\frac{1}{2}$ d per gall. must be set down as the value of the skimmed milk.

- 593 - **Model Dairy at Riga.** — FISCHER, ALB. Ein vorbildlicher stadtmilch-molke-reibetrieb. — *Molkeri-Zeitung*, Year 27, No. 15, pp. 271-273. Hildesheim, February 21, 1913.

The writer mentions in a few words the newly-established Central Dairy in the city of Riga, which has been equipped according to the newest principles of hygiene and dairy technique. It need only be added that arrangements have been made for supplying cream cheese, as well as yoghurt, kefir, homogenized milk, and nursery milk; a special cowshed has been built for the latter purpose.

- 594 - **The Nursery Milk Establishment of the Town of Stendal, Germany.** — *Deutsche Schlacht- und Viehhof-Zeitung*, Year 13, No. 9, pp. 129-130. Berlin, March 2, 1913.

Infant mortality has considerably decreased in Stendal since the existence of the Nursery Milk Establishment, which was founded some years ago. In 1911, 15.4 per cent. of the infants given the nursery milk died before completing their first year, while the mortality amongst children reared on other milk amounted to 30.5 per cent. In order to decrease the death rate still further, it was decided to pasteurize the milk in future and only to admit such cows to the shed of the nursery milk establishment as had passed a searching veterinary examination, instead of relying, as heretofore, merely upon the results of the tuberculin test.

- 595 - **The Supplying of the French Meat Market.** — HITIER: in *Bulletin de la Société de l'Encouragement pour l'Industrie Nationale*, Year 112, No. 2, pp. 336-345. Paris, February 1913.

M. Hitier first compares the stock census of 1910 with that of 1911 and thereby shows that the number of stock in France, with the exception of sheep and pigs, is increasing. The number of horses rose from 3 197 7300

in 1910 to 3 236 110 in 1911. In 1911 the mules had increased by 1 300 head over 1910, though the number of donkeys had somewhat diminished. In 1911, over 60 000 horses were slaughtered for meat in Paris.

The total number of cattle in 1911 was 14 552 430, as against 14 532 030 in 1910. The cows increased by 10 400 head and the bulls (1) by 121 770, but there was a decrease in young cattle and steers; this is attributed by the writer to increased export and to earlier maturity.

The 1911 census showed a further decrease in the number of sheep, which was 694 370 less than in the previous year. The decrease occurred in all classes, but was especially noticeable in the case of ewes. About 1 000 000 sheep are annually imported into France.

The number of pigs, which was 6 900 250 in 1910, had fallen in 1911 to 6 719 570; while in the latter year, 200 000 head were imported, and in 1912 over 400 000. The writer attributes this continual decrease in pigs to a deficiency of suitable food (potatoes).

If the results of the census are compared with the increase in population, it is clear that in spite of the increasing number of cattle exported, France can produce much more meat than is required for her own needs.

M. Hitier also considers the question as to how far Madagascar and West Africa could supply France with meat. According to Prof. Moussu, who has studied live stock in these districts, cattle-breeding is one of the chief sources of revenue of the Madagascar farmer. The cattle (exclusively zebus) produce meat of good flavour, but the animals are not scientifically treated and mature late. Official statistics, in which the wild native breeds of the island do not appear, give the number of zebu as roughly 4 500 000, of which about half are females. Each year some 500 000 zebus are slaughtered. As from 250 000 to 300 000 head amply supply the wants of the island, Madagascar could send every year at least 100 000 zebu to France if the trade were properly organized (2).

The official statistics of French West Africa give the number of cattle as 5 000 000. These belong partly to the zebu and partly to the N'Dama breed. Though the latter are useless for export on account of their small size, yet when crossed with zebus they give very satisfactory results. The zebu of the French Congo fatten easily; their average weight is 660 to 1 100 lbs. and they kill 50 to 55 per cent. In the Sudan, the price of a zebu is from 35 to 50 shillings, but it is twice as much in Dakar.

M. Hitier also deals with the best method of transporting the meat to Europe and recommends the creation of Cold Storage Depots and refrigeration of the meat.

In the last two chapters, the questions are discussed of the arrangement of the existing slaughter-houses and the inspection of consignments of frozen meat from America and Australia. The writer lays stress upon the

(1) In this category are placed bull-calves to be kept for breeding (taurillons) as those that will be castrated (bouvillons). The writer considers this division ill-chosen.

(2) See No. 50, B. Jan. 1913.

(Ed.).

suitable arrangement of the slaughter-houses (especially their equipment with cold storage chambers), the necessity for slaughter-houses in cattle-rearing districts, and for forbidding the export of animals taken to the municipal slaughter-houses. It is also very desirable that the declaration of frozen meat be obligatory, as since January 6, 1912, portions of carcasses, as well as whole carcasses, may be imported.

596 - **Pregnant Animals slaughtered in Germany in 1913.** — ZEEB: in *Deutsche Schlacht- und Viehhof-Zeitung*, Year 13, No. 9, p. 128. Berlin, March 2, 1913.

The writer gives a summary of the number of cows, ewes and sows, which during the second half of the past year were found to be pregnant when slaughtered at the large slaughter-houses in Germany. He also gives the weights of the foeti.

597 - **Studies of Wines.** — PARIS, G.: in *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year XI, Series C, Parts 11 and 12, pp. 1-29. Rome, November and December 1912.

WINE-MAKING

In this report, which is supplemented by many tables, the writer (Director of the Laboratory of Agricultural Chemistry at the Royal School of Oenology at Avellino) deals with a certain number of questions in 9 chapters bearing the following titles: The nitrogen content of natural wines. Researches and studies concerning the presence of citric acid in wines. — The presence of nitrates in wines. — The determination of free tartaric acid in wines. — The estimation of volatile acidity in wines. — The use of sulphur dioxide in wine-making. — The tests proposed by the Society of Swiss Chemists for testing wines. — The composition of the musts and natural wines of the Provinces of Avellino and Benevento. — The Vigilance Service for the application of the law of July 11, 1904 (No. 338), which aims at preventing fraud in the manufacture and sale of wines.

598 - **The Effects of Transport upon Wines.** — MATHIEU, L. *Vins et voyages. Journal d'Agriculture pratique*, Year 77 (1913), Vol. I, No. 10, pp. 305-307. Paris, March 6, 1913.

Wines which have travelled far often become turbid and lose some of their bouquet and occasionally acquire a distinctly bitter taste. These alterations are caused by excessive susceptibility to oxidation on the part of the wine, due partly to the presence of easily oxidisable substances, and partly to its very high oxydase content. The latter is especially a consequence of bacterial fermentations, which take place in these wines after bottling. Fortunately, the experience of nearly half a century has proved that bottled wines, if pasteurized, can be kept in high temperatures and transported under any conditions, without their susceptibility to oxidation giving rise to any permanent depreciation even in the case of long journeys, or when the bottles are partially empty. For this reason, the writer confidently recommends pasteurizing bottled wines.

599 - **Crystalline Deposits in Wines.** — MATHIEU, L.: in *Journal d'Agriculture pratique*, Year 77 (1913), Vol. I, No. 8, pp. 240-241. Paris, February 20, 1913.

Small deposits of very different appearance, but formed of the same substances (potassium bitartrate and a little neutral calcium tartrate) are often found in wines. The formation of these deposits, which is larger when the wine has been exposed to a low temperature and possesses a high acid content, can be taken as a sign that the wine has not been watered. Chemists should take into account the fact that the amount of tartar precipitated represents so much decrease in the dry extract of the wine.

600 - **The Removal of Acidity from Musts and Wines.** MATHIEU, L.: in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1005, pp. 393-398, Paris, March 20, 1913.

After giving a short historical review of the subject, the writer deals with the action of cold and of various saturants in freeing musts and wines from acids, and concludes that the best results are obtained by a proper use of neutral potassium tartrate. The article also refers to the legislative side of the question.

601 - **Abnormal Musts and their Treatment.** - ASTRUC, H. in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1001, pp. 254-265. Paris, February 20, 1913.

The composition of a grape-must may vary considerably according to the effect of the weather and the parasitic attacks which the vine has undergone during the year. The anomalies affect primarily the chemical composition of the must, this being noticeably altered, and secondly they influence the natural microbic content. The writer carefully studies both these points and mentions the precautions necessary in making wine from abnormal musts.

602 - **On the Composition of the Maconnais-Beaujolais Wines from the 1912 Vintage.** — FATUREL, G.: in *Le Progrès Agricole et Viticole*, Year 30, No. 11, pp. 343-348. Montpellier, March 16, 1913.

The writer analysed 43 samples of red wines and 13 of white and the results given in the 4 tables make it possible to estimate the general composition of the whole vintage, which was that of an average year.

The alcoholic strength varies, in the case of the red wines, from 7 to 12°, and in that of white, from 9 to 12°.

603. - **The Application of Artificial Cold to Food Products (Early Vegetables, Meat, Fish, Musts and Wine) in North Africa.** - LECQ, H.: in *Revue Agricole et Viticole de l'Afrique du Nord*, Nos. 47 and 48, pp. 102-108 and 131-134. Algiers, February 1 and 8, 1913.

In this communication, which was made to the Second French Cold Storage Congress (Toulouse 1912), the writer deals with the possible application of artificial refrigeration to agricultural purposes in North Africa and treats of it especially from two points of view: 1) Exportation of perishable articles of food: vegetables, meat, fish. 2)

Manufacture of wine, particularly as regards the fermentation of musts and their transport in a natural condition.

In the second part of his paper, which is the more developed and contains very interesting details respecting wine-making in hot climates, the writer enumerates the many advantages which can be obtained from the use of artificial cold.

604 - **The Manufacture of Nipa Alcohol in the Philippines** (1). - CAVEL, L.: in *Revue Générale de Chimie pure et appliquée*, Year 15, Vol. XVI, No. 2, pp 17-20. February 2, 1913.

BREWING AND  
DISTILLING

The leaves of the palm *Nipa fruticans* rise from the stem a little above the soil, thus giving it the appearance of a large ornamental plant with a height of 8 to 10 ft. The plantations are situated near the sea coast and form actual forests crossed by innumerable streams. There palms grow abundantly on land alternately submerged and left dry by the tide. The fruit is formed of drupes, which on reaching maturity separate, fall to the ground and are carried away by the tide to places where the soil has become muddy and where they eventually germinate. According to Enrique Zobel and Conrado, the plant is mature at the age of 4 years; and from 1000 to 1200 occupy an acre.

The saccharose content of the sap (called « tuba ») is sometimes 14 per cent., i. e. nearly as high as that of the juice of the sugar beet. The writer has observed that the sap of the trees growing near the sea is the richest in sugar. The « tuba » is obtained towards the end of February, or beginning of March, after the ripe fruits are gathered. A receptacle is attached to the incised stem, which catches the sugary liquid drop by drop. It is necessary to keep on cutting the stem so that the « tuba » may not obstruct the pores. The average yield per tree is 7 ½ to 9 gallons; the amount increases during the first 50 or 60 days of the tapping, and decreases in the subsequent 30 days. If the tree is further tapped, it dies.

The must ferments of its own accord in 24 to 30 hours; it is then distilled and an alcohol of 94 to 96° is obtained. The primitive methods employed in fermentation and distillation result in a yield of from 3.8 to 4 per cent. in the case of sap with an average sugar content of 14 per cent. It would therefore be advantageous to try and improve this production, for if there are really 1000 trees per acre, each furnishing 9 gallons of 14 per cent. sap, a yield of 12500 lbs. of sugar ought to be obtained per acre; this remarkable product would be of much value to all countries with a hot damp climate, like that of the Philippines.

605 - **The Content of Soluble Nitrogenous Substances, as a Criterion of Flour.** - ROUSSEAU, EUG. and SIROT, MAURICE: in *Annales des Falsifications*, Year VI, No. 52, pp. 78-84. Paris, February 1913.

BREAD MAKING

In the estimation of flour, analytic results, as a rule, merely confirm the judgment passed upon its quality by the miller or the baker,

as a result of a trial of its bread-making qualities, or even of a simple examination. Sometimes, however, chemical analysis reveals no special characteristics in flours which are perceived by the baker to be bad. The writers have studied such cases, and have ascertained some facts of great practical importance. The estimation of soluble nitrogen, of total nitrogen, of gluten and of acidity in twenty kinds of flour of good quality has shown that the proportion of soluble nitrogen to total nitrogen varies within very narrow limits, and that, in good flours, it is always about 1 to 5.72. This proportion sinks rapidly if the flour is kept under bad conditions and may become very low (1.15) in damaged flours.

A whole series of experiments made by the writers on flours of different origin and in which they established the proportion  $\frac{\text{total nitrogen}}{\text{soluble nitrogen}}$ , has proved that this must be about 5.72 for the flour to be good for bread-making.

Suspicious flours which had shown on analysis too much acidity, but were considered good by the baker, have proved to vary very little as regards the normal proportion of  $\frac{\text{total nitrogen}}{\text{soluble nitrogen}}$ . This instance shows why the bakers prefer making bread from rather old flour with a perceptible acidity, as this does not affect the bread-making as much as has been supposed.

Flours of normal composition, but with the proportion  $\frac{\text{total nitrogen}}{\text{soluble nitrogen}}$  considerably below the normal were, on the other hand, unsuitable for bread-making.

The writers record the same decrease in flours which "relâchent" (1), as well as a progressive diminution in flours which have been kept under bad conditions of preservation.

The writers conclude that:

1. In good flours the proportion of total nitrogen to soluble nitrogen is about 5.72 to 1.
2. As soon as this proportion falls below 5.2, the flour is of inferior quality and is in some way unsuited for being made into bread.
3. It seems to be a corollary that for flour to be good it is necessary that the amount of soluble nitrogen present must be in the above-mentioned proportion to the total nitrogen content, and this independently of the acidity, which is sometimes not high in bad flours.
4. The estimation of the proportion of total nitrogen to soluble nitrogen is the best method for enabling chemists to pronounce with some certainty upon the bread-making quality of the flour submitted to them for examination.

(1) This term is applied to flour, usually made from badly harvested grain, which after kneading, and when left for a time before placing it in baskets, gives out water which rises to the surface. The baker is obliged to add more flour and re-work the dough, thus obtaining less bread and a product of inferior quality. (Ed.).

- 606 - **The Chemical Composition of Sharps and Bran.** — TÁNGL, F. and WEISER, S. Aus der Kgl. ungar. thierphys. Versuchstation in Budapest. — *Die Landwirtschaftlichen Versuchs-Stationen*, Vols LXXIX and LXXX, pp. 323-328 Berlin, 1913.  
 A nalysis of Hungarian bran and sharps.

*Average chemical percentage composition.*

	Water	Ash	Crude protein	Fat	Crude fibre	Nitro- gen-free extract
Sharps (15 samples)	13.00	5.98	15.30	4.50	9.45	51.77
Bran (25 samples)	13.00	6.78	15.50	3.60	8.91	52.21

The higher fat content of sharps is characteristic and due to the presence of portions of the embryo. The pure protein and starch contents are discussed.

- 607 - **Researches on the Digestibility of Bread.** — NEUMANN, M. P. Mitteilung aus der Versuchsanstalt für Getreideverarbeitung, Berlin: in *Die Landwirtschaftliche Versuchs-Stationen*, Vols LXXIX and LXXX, pp. 449-463. Berlin, 1913.

As the organoleptic properties of the Prussian soldiers' black bread («Kommissbrot») entirely compensate for its slightly inferior digestibility, the continued making of this bread is considered justifiable.

Experiments with a bread and beer diet are discussed, as also the method of determining the fatty matter in bread; for this purpose Polensk's method is recommended; or that by the writer and Kahl ing.

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## PLANT DISEASES

### GENERAL INFORMATION.

608 - **The Establishment of a Danish Phytopathological Station for the Inspection of Plants Destined for Export to the United States.** — *Communication of the Danish Office of Correspondence with the International Institute of Agriculture.*

In accordance with a suggestion advanced by the Society of Danish Nurserymen, the Ministry of Agriculture of Denmark has approved the establishment of an official Inspection Station for living plants, in order to comply with the regulations of the "Plant Quarantine Act of 20th August 1912", which was passed by the United States for the control of the importation of living plants to that country (1).

The following are the regulations for this Inspection Station :

§ 1. — The Control Station is entitled : "The Station of the Ministry of Agriculture for the Inspection of Nursery Gardens and Nursery Garden Produce."

§ 2. — The inspection Station is under the direction of the Ministerial Adviser in Agricultural and Forest Zoology (at present Prof. Boas, Ph. D.), and the Ministerial Adviser in Plant Pathology (at present Kølpin Ravn, Ph. D.) ; the latter acts as Manager of the Inspection Station. No special remuneration is received by the Advisers for the discharge of these duties.

§ 3. For the performance of the actual control work, the Directors of the Inspection Station appoint one or more Assistants, experts in plant pathology, whose appointment must, however, be sanctioned by the Ministry of Agriculture. The Assistants are required to keep a register of all the work done at the Inspection Station, and to furnish the Director, at the close of each financial year, with a report of the inspections made in the course of the year.

The Assistants receive 20 kronen (22s 6d) in payment of their services, which sum according to § 7, is paid by the requirer of the certificate. In addition, they receive 10 kronen a day for their expenses during official journeys, their travelling expenses also being paid, according to § 7.

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(1) See No. 182, B. Feb. 1913.

(Ed.).

§ 4. — Nursery gardeners who desire the inspection of their produce, must address to the Manager of the Inspection Station at least a fortnight before the time of the required inspection, stating when and where the latter is to take place, and the number of plants to be examined.

§ 5. — Only plants raised in Danish nurseries are inspected. The inspection takes place immediately before the packing of the consignment in question.

After August 1, 1913, only such consignments of plants can be inspected as come from nurseries which have been under supervision during the development of the plants and have been found free from injurious insects and such plant diseases as may be regarded as communicable.

Requests for inspection must be made every year to the Director of the Inspection Station, by July 1 at latest.

§ 6. — If the consignment is found to be free from injurious insects and plant diseases, a certificate to this effect is given. The certificate is signed by the Assistant who has made the examination and ratified by the Director of the Inspection Station. Two copies are made, one of which is given to the applicant, while the other is kept in the archives of the Inspection Station. The certificate is written upon a prescribed form, the text being in both Danish and English. The form is sent free of expense by the Manager of the Inspection Station.

§ 7. — The drawing up of the above-mentioned certificate costs the recipient 20 kronen. He has, in addition, to defray the expenses of any journeys undertaken by the Directors or Assistants, for the purpose of the inspection, *i. e.* 10 kronen per day for their expenses and the second class railway fare, or first class steamer fare; he is also required to convey the officials to and from the nearest railway station or steamer landing-place.

§ 8. — The payments mentioned in § 7, are to be made to the Manager of the Inspection Station on his presenting the account. All correspondence regarding this, or other matters regarding the Inspection Station, should be directed to the Manager of the same.

§ 9. — The cost of printing the forms mentioned in § 6 is defrayed by the Association of Danish Nurserymen, which is regarded as the representative of the nursery gardens in the matter of the inspection by the Station.

§ 10. — An account of the receipts and expenditure of the Inspection Station for every financial year, as well as a report of the work during the same period, is sent by the Manager to the Ministry of Agriculture. The cost of keeping the register mentioned in § 3, as well as the postal expenses of the Manager and his assistants, are paid by the State and included in the statement of accounts furnished by the Manager.

## BACTERIAL AND FUNGOID DISEASES.

609 — **Plant Diseases in Grenada 1911-1912.**— AUCHINCLOSS, GILBERT in *Imperial Department of Agriculture for the West Indies, General Administration, Report on the Agricultural Department, Grenada 1911-1912*, pp. 6-7 Barbados, 1913.

**Scale Insects and Black Blight.** — Scale insect attacks have not so far been of serious commercial importance in Grenada, as cacao, almost the sole crop of the island, is practically free from the insects; but owing to the accompanying black blight, and in view of the likelihood of future development of citrus cultivation, their control is a matter of considerable importance.

The controls known in Grenada at present are: shield scale fungus (*Cephalosporium Lecanii*), red-headed fungus (*Sphaerostilbe coccophila*), black fungus (*Myriangium Duriaei*), scarlet ladybird (*Cycloneda sanguinea*), small black ladybird (probably *Scymnus* sp.), spotted ladybird (*Megilla maculata*), and a hymenopterous parasite (*Coccophagus?*). Of these, the first named is at present of great importance and the red-headed fungus is likely to be of much use.

**Bud rot of Coco-nuts.** — This has been noted on the west coast, and in districts of the northern and southern parishes; the spread of the disease has been very slow and, so far, the felling and burning of the trees has been found the safest means of control. At present, importation of coco-nuts from countries known to be infected is prohibited by law.

**Root Disease.** — This is due to a fungus (*Rosellinia* sp.), which attacks cacao, nutmegs, castilloa, avocados, immortels (*Erythrina* spp.), and camphor, and possibly banaras, in Grenada. Of these, castilloa and nutmegs appear the most seriously attacked. Cacao suffers only in very damp localities. The fungus has been found in every district of the island, and since castilloa is attacked immediately after planting in the forests, it is probable that the disease is naturalized in, or indigenous to, Grenada. This point, however, requires further working out.

**Boll Disease of Cotton.** — This is probably of bacterial origin. A continuous record of its ravages has been found from 1903 onwards. It is at present a serious obstacle to cotton-planting on the heavy lands of Grenada. The bolls are attacked just before opening, with the result that the carpels shrivel and the lint cannot arrive at maturity. Selection of disease-resistant types is probably the most satisfactory line of future work.

**Thrips.** — These insects (*Physopus rubrocinctus*) commit considerable ravages annually in the dry season, on cacao, causing discoloration of the pods and defoliation of the trees. The continuous defoliation sometimes leads to the death of the latter. This insect is usually associated with defective methods of tillage and draining, but it is possible that its attacks are sometimes intimately connected with exposure and lack of shade.

*Thread blight and horse hair blight* are two fungi occurring on nutmegs and cacao: the former is not thoroughly known, while *Marasmius equicrinis* is at present of mere botanical interest in Grenada, having only affected two or three trees.

The *shield-back bug* (*Nezara viridula*) is a nuisance on pigeon pear, tobacco and cowpeas in the southern drier districts of the island. A small hard-back beetle attacked cotton in 1911. The insect appeared in large numbers in October and November and fed on the bases of the petals and stamens of the flowers.

610 - The Germination of the Winter Spores of *Plasmopora viticola* (1) - RAVAZ, L. and VERGE, G.: in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, 1st Half-year, Vol. 156, No. 10 (March 10, 1913), pp. 800-802. Paris, 1913. — *Le Progrès agricole et viticole*, Year 30, No. 11, pp. 327-331, figs. Montpellier, March 16, 1913.

FUNGI

The writers record having observed, since 1911, in the case of thousands of zoospores, that when these are placed in suitable conditions of moisture and temperature, no rigid ramified conidiophore is formed, but a fine, sinuous, flexible mycelial thread of very variable length, which easily makes its way between the cells of the leaves of the host vine and reaches the exterior, by means of either the stomata or some slit in the leaf-tissue. The free end of the mycelium at once swells at its extremity, giving rise to a single conidium, similar in form to the summer conidium, but much larger. As soon as it is mature, the conidium separates from its stalk like the summer form, the contents divide up, and an aperture appears at the apex; through this the zoospores escape in one or two batches. The writers have counted up to 40 zoospores per conidium, but consider this is below the actual number. As soon as the zoospores have escaped from the conidium, they separate and swim rapidly in the water. These winter forms much resemble the summer zoospores in shape and structure, but are often larger and their cilia are occasionally swollen at the tips.

On placing the zoospores in a drop of water on the lower surfaces of the leaves of *Vitis vinifera*, the writers have observed, at the end of February and the beginning of March, both conidiophores and lesions due to the fungus.

They finally describe an easy method of technique to be adopted in searching for germinating zoospores; such a search might furnish useful indications for forecasting the *first* outbreak of mildew.

611 - *Peronospora Cephalariae* sp. nov. - VINCENS, F. Étude d'une espèce nouvelle de *Peronospora*: *Peronospora Cephalariae* nov. sp. - *Bulletin trimestriel de la Société Mycologique de France*, Vol. XXIX, Part 1, pp. 174-180, plate VI. Paris, March 1, 1913.

A description of the new species of *Peronospora* discovered in May 1909 on *Cephalaria leucantha* Schrad., and afterwards observed on

two other plants of the same genus in the Toulouse Botanical Gardens. This fungus is very near *Peronospora Dipsaci* Tul., which occurs on teazel (*Dipsacus fullonum* L.), but is quite distinct from it.

612 — **The Wetting Power of Fungicides** (1). — FONZES-DIACON, H.: in *Progrès agricole et viticole*, Year 30, No. 11, pp. 331-332. Montpellier, March 16, 1913.

VERMOREL, V. and DANTONY, E. *Ibid.* (Édition de l'Est-Centre), Year 34, No. 12, pp. 363-365. Montpellier, March 23, 1913.

M. Fonzes-Diacon suggests a simple method by which vine growers may ascertain whether the cupric sprays used for the control of peronospora really possess "wetting power", which, according to M. Ravaz' definition, means that instead of running off the green parts they spread on them, thus covering them with an even coating of mixture, and at the same time reaching the interior of the most compact clusters of blossoms; these latter are hardly touched by ordinary "non-wetting" fungicides. For this it is only necessary to prepare the cupric mixture by dissolving the powder to be used in a quart of ordinary water; after stirring it, a vine leaf should be dipped into the mixture. If the latter has the wetting property, the leaf, on withdrawal, is found to be covered with a uniform uninterrupted film, both surfaces being alike wetted, which would not have been the case had the leaf been dipped into water or an ordinary "non-wetting" cupric mixture. Further, when the leaf has become completely dry in the air, it will be observed that the mixture has left a continuous coating of copper compounds on all the surfaces with which it has been in contact. Experiments made with bunches of grapes, at any stage of development, should give the same results. When the vine is not in leaf, the "wetting" property of the mixture can be tested on cherry-laurel or ivy leaves.

MM. Vermorel and Dantony, on the other hand, contend that the property of the mixture can only be tested by applying it to the vegetative organs for which it is destined, and observing if these are covered with a uniform coating.

To test the "wetting" property of a mixture still better, a little methylene blue may be added; then, if the leaf is immersed and dried, and subsequently placed in a letter copying-press, a clear and faithful impression is left of the vine-leaf, showing that the treatment has been wholly successful.

613 — **Rotting of Tomatoes caused by *Phytobacter lycopersicum* sp. nov.**

— GROENVEGE, F.: in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Part 2, Vol. 37, No. 1-3, pp. 16-31, 1 plate. Jena, March 8, 1913.

In the course of the summer of 1911, the Phytopathological Institute of Wageningen (Holland) received several times tomatoes attacked by a rot, which showed itself in the form of brown patches, usually corresponding to the point of insertion of the style, but sometimes occurring also on other

parts of the fruit. The rot extended all round the portion first attacked and also affected the underlying tissues, in which microscopic examination revealed the presence of bacteria only.

In the Netherlands, the disease was observed in 1904 for the first time; it was afterwards recorded in the annual reports of the Wageningen Phytopathological Station for 1906 and 1910.

But at a still earlier date this disease was recorded as occurring in the North of France (1895) by Prillieux, who considered it of bacterial origin, in North America (1896) by Earle, and in England and Denmark by Rostrup.

The writer was able to make practical researches in the West of Holland into the appearance, development and spread of the disease. Though not of a serious nature, it nevertheless was of frequent occurrence in the fields. He considers that there is a connection between the appearance of this disease and the prolonged cultivation of the tomato, which practice gives rise to a partial soil sickness (not to be wholly remedied by the use of fertilizers) and consequently to a decrease in the resistance of the plants to the disease.

In a greenhouse in the neighbourhood of Wageningen, where tomatoes had been grown for a long time, the rot did much injury. On replacing the old soil to a depth of 10 or 12 inches by fresh earth, the tomatoes subsequently grown succeeded well. This shows, according to the writer, that the parasite generally occurs in the soil and that the presence of the tomato plants is favourable to its development. The latter is also assisted by the practice of leaving the diseased fruits on the ground. It is therefore necessary to collect and carefully destroy all tomatoes attacked by the disease and not to use them for manure. If the soil is renewed at sufficiently short intervals, the percentage of fruit attacked is considerably reduced. When possible, it is well to turn over the soil in such a manner as to substitute a completely fresh layer for the former surface soil.

Another factor predisposing the plants to the disease is dampness; greenhouses used for tomato cultivation should therefore be suitably ventilated.

Usually the fruits which are nearest the ground are the first attacked, and the disease is limited to them, which proves, in the writer's opinion, that the infection comes from the soil.

Mr. Groenewege was able to isolate, from material sent to him from different parts of Holland, a bacterium, which he describes minutely under the name of *Phytobacter lycopersicum* sp. nov.

Infection experiments showed this bacterium to be a wound parasite.

Nevertheless, the writer is not in a position to assert whether this micro-organism is the first cause of the disease, or whether, as Earle supposes, it finds way into the fruit through punctures made by small insects. He remarks that this opinion of Earle's is, at present, a mere hypothesis.

- 614 - A Case of Specialized Parasitism in the *Uredineae*: *Gymnosporangium tremelloides* parasitic on the hybrid *Sorbus confusa* Gremli. — GUINIER, PH. in *Comptes rendus hebdomadaires des Séances de la Société de Biologie*, Vol. LXXIV (1913), No. 11, pp. 648-649. Paris, March 21, 1913.

In the neighbourhood of Annecy (Haute-Savoie), the following trees are found growing together in the same coppice: *Juniperus communis* L., *Sorbus Aria* Crantz, *S. torminalis* Crantz, as well as a large number of their hybrid *S. confusa* Gremli. In 1911-1912, the writer observed that *S. Aria* was severely attacked by *Gymnosporangium tremelloides* R. Hart., *S. torminalis* was completely immune; the hybrid, on the contrary, shared almost equally the immunity of *S. torminalis* and the susceptibility of *S. Aria*, as far as this fungus was concerned. *S. confusa* offered sufficient resistance to the parasite to limit its extension and, as a rule, to prevent the normal formation of aecidia, but not enough to arrest its development. Its resistance, however, varies as regards the individual fungi, which develop simultaneously on the same leaf. The fact that only some of these produce aecidia seems to point to the existence of races more, or less, capable of overcoming the relative immunity of *S. confusa*; in the opinion of the writer, we have here the beginnings of a specialised form. M. Guinier intends continuing his observations in this direction.

## PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC  
AND OTHER  
INJURIOUS  
FLOWERING  
PLANTS

- 615 - *Hyoscyamus agrestis* Kit. in Poppy Crops. — MALZEFF, A. J.: in *Annalen der Samenprüfungsanstalt am Kaiserlichen Botanischen Garten zu St. Petersburg*, Vol. I, Part 7, 9 pp. St. Petersburg, 1912.

M. Malzeff has identified seeds of *Hyoscyamus agrestis* Kit. (1) collected in Podolia, Volinia, Kherson, Jekaterin oslav, Khaikov, Voroneshsk and Kursk. It has been observed, both by himself and others, that *H. agrestis* infests the poppy crops of South and South-West Russia, as well as the fields of millet and flax in the Province of Voroneshsk.

## INSECT PESTS.

VERALITIES

- 616 - *Injurious and Beneficial Insects of California*. — ESSIG, E. O.: *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 12, pp. XXXI + 351, 321 figs. Sacramento, California, January-February 1913.

A concise and practical description, for the use of Inspectors of Fruit Culture and of Horticulture, of the insects and other invertebrates of known economical importance existing in California. The writer gives

(1) According to the *Index Kewensis*, *Hyoscyamus agrestis* Kit. is a synonym of *H. niger* L. (Ed.).

a brief account of the general appearance of each species, its life-history, distribution, host plants, and the natural and artificial methods of its control. Hints follow on catching the insects, the use of collectors, and the different remedies used. A list is given of the legislative enactments and administrative measures in force in California respecting the animal parasites of plants.

- 617 - *Cocobacillus Erausquinii* sp. nov. Parasitic on *Romalea miles* in Argentina. — CULLEN, HUGO and MAGGIO, CARLOS. Descripción de un nuevo Cocabacilo Patógeno para la Langosta. — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 11-12, pp. 1368-1373, 3 figs. Buenos Aires, 1912.

MEANS OF  
PREVENTION  
AND CONTROL

A detailed description of *Cocobacillus Erausquinii* sp. nov., isolated by the writers from some diseased specimens of locusts, *Romalea miles* Drury, which they found in January 1912 in the Department of Las Colonias. There are many characters distinguishing the new species from *C. Acridiorum* F. d'Herelle.

- 618 - Parasites of Insects attacking Sugar Cane. — PERKINS, R. C. L.: *Reports of the Work of the Experiment Station of the Hawaiian Sugar Planters' Association, Entomological Series, Bulletin No. 10*, 27 pp. Honolulu, Hawaii, 1912.

This is a systematic description of different Chalcids, which are nearly all reared from the eggs of insects, parasitic on the sugar cane in America, Fiji, China and the Malay archipelago. The genera *Neotetrastichus*, *Jassidophthora* and *Eomymar* are new to science, as are also several species belonging to the genera *Ooetetrastichus*, *Closterocerus*, *Westwoodella*, *Pentarthron*, *Gonatocerus* and *Polynema*.

- 619 - The Caterpillars of *Thaumetopoea (Cnethocampa) herculeana* Injurious to Low-Growing Plants in the Neighbourhood of Tunis. COMIE, A. Chenilles nuisibles aux plantes basses. — *Revue Agricole et Viticole de l'Afrique du Nord (Algérie-Tunisie-Maroc)*, Vol. II, No. 44, pp. 33-34, 1 fig. Algiers, 1913.

INSECTS  
INJURIOUS  
TO VARIOUS  
CROPS

The writer records the presence, in the neighbourhood of Tunis, of an enormous number of the caterpillars of *Thaumetopoea (Cnethocampa) herculeana*. These, before pupating, migrate and devour every kind of low-growing plant, whether wild or cultivated: cereals, lucerne, clovers, thistles, mustards, lettuces, spurge, docks, etc.

The writer recommends for the control of this pest, the burning of the nests of the caterpillars as soon as they are discovered, and the destruction, during winter, of weeds growing near crops.

- 620 - *Phytalus smithi* and other Insects Injurious to Sugar Cane in Mauritius (2). — D'EMMERZÉ DE CHARMOY, D. Rapport sur *Phytalus smithi* (Arrow) et autres Scarabées s'attaquant à la Canne à sucre à l'île Maurice, 35 pp., 8 plates, 1 map. Port Louis, 1912.

In the first part of his report, the writer gives a detailed description of the development and habits of *Phytalus smithi* Arrow. This insect,

(1) See No. 750, B. April 1912.

(Ed.)

(2) See No. 1587, B. Nov. 1912.

(Ed.)

having been energetically controlled in 1911, thanks to the intervention of the Government, did not reappear in Mauritius the next year; nevertheless it is necessary to continue to keep a careful and systematic lookout in the district where it occurred.

Amongst the natural enemies of *Phytalus* are a minute mite (*Gamasus* sp.), and some micro-organisms which have so far not been determined. Further researches are necessary as to their efficiency in the control of the pest. Amongst insecticides should be mentioned especially petroleum emulsion with creolin or with carbolic acid.

A list and description follows of the other Scarabeids which, like *Phytalus*, live at the expense of the sugar-cane roots. These are: *Adoretus versutus*, *A. compressus*, *Serica* sp., *Oryctes tarandus*, *O. insularis*, *Oryctes* sp., *Gymnogaster buphthalmia*, *Agrypnus fuscipes*, *Eutuchia fullo*, *Opatrum crenatum*, *Cratopus punctum*, *Trocharocephalus strangulatus*.

In conclusion, the writer enumerates other insects attacking sugar cane in Mauritius: a) Lepidoptera — *Cyllo leda*, *Leucania unipuncta*, *L. loreyi*, *Sesamia nonagriodes*, *Spodoptera mauritia*, *Diatraea striatalis*, *Grapholita schistaceana*, *Alucita sacchari*; b) Hemiptera — *Aphis sacchari*, *Tetraneura lucifuga*, *Dactylopius calceolariae*, *Sphaerococcus bambusae*, *Chionaspis tegalensis*.

621 — *Icerya purchasi* damaging Tangerines and Lemons in Sicily. — DE STEFANI, PEREZ TEODOSIO: in *Bollettino del Regio Orto botanico e Giardino coloniale di Palermo*, Year XI, Part 1-2-3 (Jan-Sept. 1912), pp 81-82. Palermo, 1913.

The orange scale, already known from the citrus groves about Messina and Catania, has recently been observed at Bagheria. Some tangerines are already dead, and a good many young lemons are in process of dying.

622 — Notes on the Chief Insects affecting Forest Trees in Great Britain. — JENNETT, C. W. *South-Eastern Agricultural College, Wye (Department of Zoology and Entomology)*, 44 pp. + figs. Ashford and London.

A description, accompanied by plates, of the chief insects (Lepidoptera, Coleoptera, Hymenoptera, and Hemiptera) which are injurious to forest trees in Great Britain and of the best methods for their control. In the appendix, the means of preventing the damage done by these insects are briefly described.

623 — Chalcidids Injurious to Forest Tree Seeds. — ROEYER, S. A.: in *U. S. Department of Agriculture, Bureau of Entomology, Technical Series, No. 20, Part VI*, pp. 157-163. Washington, 1913.

The Chalcidids hitherto known to be injurious to the seeds of forest trees (*Sorbus* spp., *Abies* spp., *Tsuga* spp., *Pseudotsuga* sp.) are as follows: *Syntomaspis druparum*, *Megastimus* sp., *M. brevicaudis*, *M. strobilobius*, *M. pinus*, *M. spermotrophus*. The complete life-cycle is known only for the first-named, which is also destructive to the pips of apples.

INTERNATIONAL INSTITUTE OF AGRICULTURE  
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of April and May 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

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FIRST PART.  
ORIGINAL ARTICLES

**The Problem of Irrigation in the South of Italy and in Sicily**

by

ORESTE BORDIGA

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at the Royal Higher School of Agriculture of Portici.*

The distribution of rainfall in the South of Italy and Sicily is characterized by a very low precipitation during the summer, as is the case in the whole Mediterranean region, to which those countries belong. During the summer the Adriatic slope of Apulia, Lower Basilicata, the west of Calabria and almost the whole of Sicily register a rainfall not exceeding 50 mm. (2 inches), while for the rest of the country it is between 50 and 100 mm. (2 and 4 inches). Throughout the whole region the small amount of rain that falls between April and the end of September takes the form of rare and violent showers. On the other hand, the autumn and winter months are very rainy, even cloudbursts occurring sometimes.

Owing to the summer drought, farmers must by preference keep to autumn sown crops, such as wheat and other cereals, beans, and a few other plants, when they cannot plant vines, almonds, olives and other fruit trees which are less exacting than herbaceous plant as to moisture in the soil. Sowing spring hoed plants would mean almost certain failure, and thus farming in those regions is deprived of the advantage which hoed plants bring into a rotation; the production of forage and consequently of stable manure are considerably limited, whence even now, notwithstanding the extended use of leguminous leys with chemicals, bare fallows frequently become an absolute necessity in the cultivation of cereals. The dryness of the air and of the soil sometimes cause the above fertilizers to give scanty or even negative results.

From the above it will be clearly understood of what immense advantage to farming even a small amount of irrigation water is. The possession of 6 or 8 inches, or 21 000 to 28 000 cubic feet per acre, of water signifies the success of wheat and bean crops in the frequent years in which the drought

begins in spring and continues throughout the summer. It represents, further, the possibility of growing hoed crops instead of resorting to bare fallow, of getting a great deal more out of the poor permanent pastures, and of doubling the produce from grass leys. Even the vine, the olive and other fruit trees, which in some years suffer from the persistent summer drought, may be greatly benefited by a moderate irrigation, and their crop ensured.

Irrigation in southern countries, assisted as it is by the higher temperature, is much more efficient than under northern climates, and its effects are sometimes quite extraordinary. There are, for instance, irrigated market gardens in Campania which are rented at £12 10 s to £16 per acre, besides which all the expenses for irrigation are charged to the farmer. In Calabria and in Sicily a delivery of 13.2 gallons per minute, which is equivalent to 530 000 to 565 000 cub. ft. in six months, is sufficient for cropping 5 to 7 ½ acres, which yield up to £ 240 income from the land, whence the geologist Comm. Baldacci was justified in saying that the above amount of water represented a profit of £120 a year.

This explains also the high prices paid for water in the South of Italy, namely ½ d, 1d, up to 1 ½ d per cubic metre, (35 cub. ft.), while in the North of Italy the managers of the Cavour Canals sell their water during the summer at less than a twentieth of a penny per cubic metre. It is evident that in the South it is of capital importance to treasure up every drop of water flowing on the surface or hidden in the depths of the soil. In this direction a good deal has been done, but a great deal more remains to be accomplished, especially for the systematic and continuous utilization of the greater water supplies of the country, in spite of the great technical and economic difficulties due to the nature of the water courses and to the surface features.

The water courses, owing to the distribution of the rain as mentioned above, are generally of the nature of torrents: that is abundantly supplied with water during the autumn and winter, to the extent of being sometimes injurious, while in summer the amount of water conveyed sinks frequently to nothing. At the latter season only the Pescara, Sangro, Biferno and a few other rivers of the Adriatic slope of the Abruzzi convey a certain amount of water. Apulia to the south of the Ofanto river, which is also almost dry in summer, has no visible water course, not even in winter, as the rainfall disappears immediately in the subsoil through the mass of limestone fissured in all directions which is the prevailing formation in that region. On the Mediterranean slope there are important streams in Campania, such as the Garigliano, the Volturno, the Sarno and the Sele, some of which afford fairly good summer irrigation, but beyond the last of the above named rivers the features and hydrography of the country are very unfavourable to extensive irrigation works.

Indeed from the Sele to the extreme south of Italy all the country is mountainous and therefore unsuitable to the economic collection and distribution of irrigation water. Along the sea shore from Paestum to Reggio and from Reggio to Metaponto on the Ionian Sea the slopes are very short, sometimes only six or nine miles in length, so that they are cut

up into an infinite number of very small catchment basins; the rainwater that falls on these is conveyed to the sea in a few days and sometimes even in a few hours. The wanton deforestation begun some centuries ago, but carried out vigorously in the last century, renders this outflow of water more rapid and increases the difficulties of the problem. Sicily is in very similar conditions for the mountainous character of the country, the shortness of the slopes, and still more for the frightful bareness of the mountain sides.

Neither in Sicily nor in the South of the peninsula, are there any high mountains which keep covered with snow throughout the year or even well on into the summer, as is the case in the Alps, whose snow and ice feed the rivers of the Po valley. The greater part of the mountains of the south do not rise higher than 3300 to 5000 feet, and by the month of May they have lost all their snow.

All this renders the problem of irrigation difficult to solve, even in the level plains of the coast which would be much benefited by watering. Nevertheless, it would be unjust not to recognise that wherever possible farmers have for some time done their best to utilize the greatest quantity of irrigation water. There are a great many irrigation works; the least numerous of them are open canals of a certain importance, the greatest number consisting of systems of raising or otherwise utilizing water from the subsoil.

Some canals exist in Campania between Vesuvius and Nocera and between Salerno and Eboli. The remains of ancient works bear witness that the cities of Magna Grecia and the Romans had excavated important canals; thus those of Sybaris were considered works of considerable utility and of great beauty. It is certain that the rivers rising in the mountains of the South, which in those days were covered with forests, were richer in water than they are at present, whence it was easier to feed canals (1).

While canals are rather rare, there are great numbers of irrigations on a small scale in which the water is raised from the subsoil or from water-courses. There is no region without some of these, and Campania is specially well supplied with them in the rich belt between Capua and the Sele. They are numerous also in the provinces of Bari and Lecce, especially along the coast; here the water is utilized notwithstanding its relatively high brackishness. Water-raising installations of considerable magnitude are met with in Calabria in the neighbourhood of Reggio, and in the ter-

(1) At Venafro in the upper Volturno valley a tablet was discovered, the so-called "Aquarian Table" which was the regulation for the use, by an association, of the irrigation water derived from that river. Lenormant, in his works *La Grande Grèce* and *À travers l'Apulie et la Lucanie*, cites texts and inscriptions, and mentions remains which prove the existence of canals and irrigation at the time of the Greek colonies in Southern Italy.

Angelo Mosso, in his work *Vita Moderna degli Italiani*, describes the ancient water works of Syracuse, where at present there is hardly water enough for drinking purposes, and comes to the conclusion that Syracuse, owing to the neighbouring mountains being covered by forests, had then more water than the best supplied large cities of the present time.

ritories of Messina and Palermo. They possess steam pumping plant and raise water from wells 65 to 85 feet and more deep. Sicily has besides an admirable system of irrigation with water from the Simetus in the plain of Catania and in the plain of Terranova on the south coast.

The machinery with which water is raised consists mostly of norias, water wheels with chains of buckets of primitive construction, often with wooden gearing and esparto ropes, with which often barely one third of the animal power employed is utilized. Where the water is not far below the surface of the ground see-saw buckets are used, or winches with leather or wooden buckets which remind one of the systems used by the Arabs along the Nile. Recently, especially in the neighbourhood of Naples, pumps with electric motors have been introduced; they permit the economic utilization of water from wells which would be too deep for the usual norias.

With the above means, raising water is always a very costly process; the best norias over wells 16, 33 or 40 feet deep supply water at about  $1\frac{1}{4}$  d,  $2\frac{1}{2}$  d or 3 d per 100 cubic feet. At the same prices water is sold in the neighbourhood of Palermo by large steam pumping installations; in the territory of Messina, where the ingenious system of underground dams and filtering galleries prevails, the price reaches  $4\frac{1}{2}$  d per 100 cub. ft.

In that district, as in Calabria, the mountain slopes are very short and steep and the torrents which descend along them have excavated very deep beds in the prevailing crystalline rocks. These beds have since been partly filled up with coarse and incoherent material carried down by the water, which even when it is perennial percolates through the loose material and flows hidden from sight on the bed-rock under the rubble. Long ago the farmers learned to dam these underground streams by means of barrages resting on the bed-rock, which cause the water to rise against them and to flow into galleries excavated just above the base of the dam and provided with apertures to receive the water. These galleries lead first to underground conduits and then to open channels which convey the water to irrigate the soil; thus even steep slopes, which have been turned at great expense into terraces sustained by the usual masonry or dry stone walls, can receive irrigation.

Such works are to be found in Calabria about Reggio, in the district of Palermo and in other parts of Sicily. Many of them are of recent construction in spite of their heavy cost, which does not allow them to supply water at less than 3 d or  $4\frac{1}{2}$  d per 100 cub. ft. Several of these works supply drinking water to inhabited centres.

From the foregoing it is seen that in the provinces of Southern Italy and of the islands there is a great prevalence of small and very small irrigation works, the greater proportion of which raise water from the subsoil at a price that only the high productivity of the irrigated crops allows to be paid without working at a loss.

The State has always endeavoured to further irrigation throughout the whole country, but it has bestowed most care on the valley of the Po, which possesses in the installations of Piedmont and of Lombardy examples of irrigation works unique in the world. Several causes favoured the

spread of irrigation in those provinces, especially the facility with which associations of landowners were formed for the construction of the minor works intended to receive the water from the main canals excavated by the previous Governments and by the present one. Considering the benefits which these associations had conferred upon that part of the country for centuries, it was thought advisable to favour the constitution of similar associations in the South of Italy, but the attempt failed completely on account of the lack of tradition of such organizations and of the habit of free initiative.

Laws on the matter were enacted in 1873 and 1886, while the law of 1882 promoted associations for reclaiming lands. Irrigation associations receive yearly subsidies amounting respectively to 3, 2 and 1 per cent. of the capital spent during the 1st, 2nd and 3rd decade from the execution of the work. These grants were, however, subordinate to the condition that at least 106 cub. ft. of water per second should be conveyed. With quantities of water not inferior to 10.6 cub. ft. and in exceptional cases to 2.6 cub. ft., this subsidy was reduced to two-thirds of the above. Thus the south of Italy and the islands, in which small irrigation works necessarily prevail, were excluded from the benefits of the law, and notwithstanding all the fiscal concessions offered to new associations, it was not possible to constitute a single one, though here and there good private initiative was not wanting.

The State realized then that a different plan should be followed, and that in the first place it was necessary, in order to provide the greater part of the South of Italy and the islands with water, to study the possibility of storing the surplus winter water of the rivers by means of dams. Hence in 1884 for some of the rivers preliminary surveys were made with the intention of enacting new laws in the matter. Financial difficulties, however, did not allow the realisation of these projects, and it was only by the law of August 2, 1897, for Sardinia that funds were voted for the creation of artificial reservoirs; some of these are in course of construction. (1).

At the same time the Ministry of Agriculture began collecting materials for the study of the hydrography of Italy. A special office was opened for the purpose, at first under the management of Sig. Zoppi, C. E., and now of Cav. E. Perrone. It published the hydrographical map of the kingdom, in which the most important features are shown (catchment basins, volumes of streams, water works, canals, irrigated and irrigable lands, etc.). An abundant series of memoirs accompanies this map and contains the results of the investigations of the office on the measurement of the volumes of streams, and on the hydrographical and irrigation condition of the various regions. These memoirs have been, and still are, very useful to those persons who intend to divert water for agricultural or industrial purposes.

(1) Whilst this is in the press the Government has presented to Parliament a bill for the construction of artificial reservoirs in Sardinia and Calabria, with the object of supplying water for irrigation and for motive power.

For the solution of the irrigation problem, what was still wanting was a complete review of all the water resources of the country and of the means and convenience of utilizing them. In 1910 therefore, on the proposal of the Parliamentary Commission of Enquiry into the conditions of the peasantry in the South of Italy and Sicily, a special law was passed for the appointment of a Royal Commission — to which the writer belongs — to study the subject. It was agreed that the Commission should begin its work in Apulia, where disastrous droughts are frequent. One of the most memorable ones was that of 1908, during which drinking water had to be conveyed by railway.

The above-mentioned Commission, under the presidency of Count Guiso, began immediately to enquire into the hydrographical conditions of the three provinces of Apulia (Foggia, Bari and Lecce), taking stock of their water resources, both latent and visible, and commencing to examine the question of reservoirs for that region. A few months after its appointment on June 30, 1911, the Commission presented its first report to Parliament; in this, after a general review of the problem of irrigation in the South of Italy, it communicated the results of the first enquiries made in Apulia by a special committee and its opinion on the feasibility of constructing reservoirs. The committee had visited the valleys of the Ofanto, of some of its tributaries, of the Fortore and the principal coast sources of the province of Lecce (« heel of Italy »), and had come to the conclusion that extensive irrigation was possible. The report discussed also the possibility of making use of the surplus water of the Apulian aqueduct, which, starting from the sources of the Sele on the Mediterranean slope, conveys through 112 miles of main covered aqueduct the water that the inhabitants of Apulia require. When the regular distribution of this water is made, the waste and sewage water from the inhabited centres will also be available for irrigating and fertilizing. This very complex problem has also been studied by a special commission appointed by the Ministry of Public Works. (2).

The Royal Commission proposed to the Minister to present a new law authorising the State to grant up to six-tenths of the cost of the work required by the small irrigation schemes of Southern and Central Italy which were debarred from availing themselves of the law of 1886. The Minister of Agriculture, Prof. Nitti, has recently renewed the assurance that he would present a bill on the subject, the conditions of the country not having permitted it to be done before now.

The commission will shortly present a second report, now being printed, containing detailed reports on the following subjects :

(2) Unfortunately, little or nothing has been done in this direction in the South of Italy. The city of Naples itself, which has constructed a splendid system of sewers at the cost of upwards of £800 000, allows 11.8 cub. ft. per second of sewage water collected by the above system to run to waste into the sea, below Cuma, instead of using it for the benefit of the adjoining country.

1). Construction of a large reservoir on the Fortore river in the province of Foggia for the storage of about 7 000 000 000 cub. ft. of water for the irrigation of 100 to 125 thousand acres of the plain of Apulia between Mount Gargano and the Apennines. The extent of land benefited by the irrigation might even attain 173 000 acres with the help of a derivation into the basin of the Biferno by means of a tunnel through the hills which separate the two valleys.

2). Examination of other proposed reservoirs on the Locone and Reudina, tributaries of the Ofanto, and on some rivers of the Basilicata.

3). Study of the problem of raising water from the coast sources of the Lecce district for the irrigation of the higher-lying plateaus.

4). Report on experiments on the use of brackish water (containing almost 7 per 1000) in irrigation, conducted by Prof. Celso Ulpiani of the Higher School of Agriculture at Portici and by the writer. The experiments are being continued.

5). Report on the work done in Liguria by a special commission, on minor matters and on the programme for the next years.

In the latter is included an examination of the conditions of the districts most in need of water for irrigation, among which Sicily receives special attention; in it detailed investigations will be made.

Thus the problem of irrigation in the South of Italy seems to be about to be solved in the best way that the conditions of soil and of climate allow.

Lastly, irrigation in the southern districts may find much assistance by a wide use of the so-called "serbatoi a corona". These are artificial reservoirs for rainwater or for the water of temporary streams, made by enclosing a semicircular space at the base of the hills or in the hollows between them by embankments not exceeding 33 to 40 ft. in height. Thus about 3 500 000 to 7 000 000 cub. ft. of water, and exceptionally 17 500 000 cub. ft., can be stored; at the rate of 56 000 to 70 000 cub. ft. per acre this allows fairly large extents of land to be irrigated. The provinces of Parma and Piacenza possess a good number of such reservoirs at the foot of the hills along the Apennines, where the prevailing clay formations supply an excellent material for the embankments. The Hon. Raineri, as President of the "Federazione Italiana dei Consorzi Agrari" (Italian Federation of Agricultural Cooperative Associations), has published a work on such reservoirs constructed in that region up to 1904, which may be consulted to advantage by those who wish to have a clear idea of an easy and economic way of storing water for irrigation.

#### BIBLIOGRAPHY.

1. MINISTRY OF AGRICULTURE: *Carta idrografica d'Italia*. (Hydrographic map of Italy). Large atlas with about 300 maps on the scale 1 : 100 000, accompanied by 36 memoirs illustrating the natural and artificial hydrography (irrigation and reclamation) of all the regions of Italy (from 1891 to the present time).
2. ORESTE BORDIGA: *Il problema delle irrigazioni nel Mezzogiorno d'Italia*. — *Atti del R. Istituto di Incoraggiamento di Napoli*, 1905, and *Atti del Congresso agrario di Napoli*, 1909.

3. R. ISTITUTO DI INCORAGGIAMENTO. Studi sulle acque cloacali di Napoli. — *Atti*, 1901.
  4. ORESTE BORDIGA: Le acque cloacali e pure e il costo della irrigazione. — *Atti*, 1901 and 1904.
  5. GUIDO INFERRERA: Le acque subaltee e le gallerie filtranti nel Messinese. — Catania, Battiato 1907.
  6. CESARE BIONDA: Le acque subaltee derivate mediante gallerie filtranti nella provincia di Messina. Applicabilità del sistema in altre regioni d'Italia e specialmente in Calabria. — Rome, Tip. Cooperativa Aldo Manuzio, 1908.
  7. MINISTERO DI AGRICOLTURA: Ricerca di acque potabili in Puglia. Relazione. — Rome, Bertero, 1909.
  8. V. STRINGHER: Notizie sommarie sulle irrigazioni in Italia. — Rome, Bertero, 1905.
  9. A. CADOLINI: Studi di provvedimenti per promuovere l'irrigazione in Italia. — Rome, F. Centenari and Co., 1906.
  10. COMIZIO AGRARIO DI BARI: La questione delle irrigazioni in Puglia. — Bari, tip. Sella e Carini, 1910.
  11. R. COMMISSIONE PER LE IRRIGAZIONI: Prima relazione presentata al Parlamento. — Rome, 1911.
  12. ACHILLE SCLAVO: Sul problema della fognatura in Puglia e depurazione biologica delle acque di fogna. — Siena, Tip. S. Bernardino, 1912.
  13. MICHELE CAPITO: Acque della Sicilia e mezzi di accrescerle (Camera di Commercio ed Arti di Palermo). — Palermo, Scuola tip. «Boccone del Povero», 1905.
  14. Inchiesta Parlamentare sulle condizioni dei contadini nelle Provincie Meridionali e nella Sicilia. Vol. II, Part 1: *Abruzzi e Molise* (Relazione del delegato tecnico Dott. CESARE JARACHE). Roma, Bertero, 1909. — Vol. III, Part 1: *Puglie* (Relazione del delegato tecnico Prof. ERICO PRESUTTI). 1909. — Vol. IV, Part 1: *Campania* (Relazione del delegato tecnico Prof. O. BORDIGA). 1909. — Vol. V, Part 1: *Basilicata* (Relazione del delegato tecnico Prof. EUGENIO AZIMONTI); Part 2: *Calabria* (Relazione del delegato tecnico Prof. ERNESTO MARENGHI). 1909. — Vol. VI, Part 1: *Sicilia* (Relazione del delegato tecnico Prof. GIOVANNI LORENZONI). 1910.
  15. MINISTRI DI AGRICOLTURA: Relazioni sullo studio di progetti di irrigazioni autorizzati dalla legge 28 giugno 1885. GRIMALDI 1888 e LACAVALA 1893. — *Atti della Camera dei Deputati*.
  16. G. RAINERI: I serbatoi a corona nell'Appennino. — *Pubblicazione della Federazione italiana dei Consorzi Agrari*. Piacenza, 1907.
- Every region has a considerable number of pamphlets on the subject of its hydrography and irrigation schemes.

## The Swedish Institute for the Improvement of Field Crops at Svalöf

by

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The foundation of the Svalöf Station was due entirely to private initiative, in fact to the farmers themselves. Its aim was to supply Swedish agriculture with improved and new seed. The realization and development of the original project have up to the present remained under agricultural

direction, though the bulk of the necessary funds is now supplied by the public.

The natural consequence has been that the first and sole object of the undertaking is to achieve practical results. For this reason, it has only been in special cases that scientific experiments have been carried out, and then only on subjects directly connected with questions of practice. All the same, it was happily seen from the beginning that only expert botanists could direct the variation and genesis of new forms into the required channels, that is to say lead them up to the creation of real cultural varieties adapted to their country and of high yielding capacity. It was also understood that the work must be strictly specialised, and concentrated on this one point: such subjects as teaching, comparative trials, and commercial analyses, which are often such a severe burden on the programme and staff of Experiment Stations elsewhere, were foreign to this particular line, and must be set aside.

It is to this free organization, to the carefully adapted programme, to the intimate contact with farming practice and farmers, combined with the use of the best methods and resources of Science, that one must look for the explanation of the fact that a humble provincial institution of such a comparatively poor country as Sweden, with a rather unfavourable climate, has been able to contribute to the reorganization and development of the improvement of cultivated plants to such a remarkable extent as the results of the last quarter of a century show. Another cause of success is undoubtedly its purely agricultural organization.

The question of seed supply had already been long prominent among Swedish farmers when M. B. Welinder, a young landowner at Svalöf, assisted by Baron Gyllenkrook and various other farmers in the province, founded in 1886 a local society for seed improvement. In a short time it excited so much interest throughout the country that it rapidly extended to form the Society for the Improvement of Agricultural Plants in Sweden ("Sveriges Utsädesförening"). One after another, all the Swedish Agricultural Associations, even the most northerly ones, sent in subscriptions, and lastly the State also made a grant. At the same time some thousand members from all over the country gave their financial and moral support.

The undertaking was annexed to a free association of farmers, so as to have their direct interest in the work going on, as well as their regular subscriptions. There are two classes of members: life members, who pay about £5 11s once for all; and annual members, who pay 5s 6d a year. A committee of seven members — farmers and others — acts as executive, finance committee, etc.; three of these are elected by the Society itself, three by the delegates of the Agricultural Associations who form a consulting council, and one by the State. The Society publishes a periodical Review, as well as special leaflets as required. By giving advice, making expert judgments, directing local comparative trials and special seed shows, examining local varieties, and other such work, the Society endeavours to carry out as far as possible the task which it has set itself, namely of bringing about a general improvement in the growing of crops in the country.

The funds required for carrying on the work come from various sources. The members' annual subscriptions give an average of about £147; the Agricultural Associations have given about £885 a year, latterly rather more; the State gave £833 a year from 1890 to 1905, and since then has given £2 222. At present, there is a proposal under consideration for raising the State grant to £4 444; this would include the subscriptions from the Agricultural Associations, who would withdraw their support. The sale of new varieties (which will be referred to later) has brought in to the Society a steadily increasing profit; in the period 1901-06 it averaged nearly £290 a year, and has now reached £2 440. Thus the income of the Society for 1913 is about £6 000. Out of the subscriptions of the life members (totalling some £2 000), a fund was set apart for buildings; these were also liberally endowed by friends of agriculture, showing what great interest has been aroused by the undertaking: the total endowment is now £15 275.

The Society has now a large and well-equipped establishment, comprising two buildings for laboratories, a building for seed preparation, a small farm and a dwelling-house. The land is 40 acres, of which 25 are reserved for special plots and for increasing the seed-supply. All the same, it has been found necessary to grow the greater number of the trial crops — the real experimental plots — on the large estate adjoining, so as to give the various cereals (together occupying 30 acres) their proper place in the rotation; this has been found absolutely essential for normal development.

*History of the development of the methods of work.* — The starting-point of the work was naturally methodical selection, which was accepted and adopted everywhere at that time, in accordance with Darwin's theory, still considered capable of resolving the problem of the formation of species in nature. A treatise on these ideas, characteristic of the epoch, was published by K. Rümker in Berlin in 1889, under the title of "*Getreidezüchtung*"; this was considered from 1890 to 1910 as a classical summary of the experiments on the improvement of agricultural plants. It must suffice to say that it was believed that the continued and methodical selection of plants showing some common quality or tendency, would lead to the creation of a new and constant form containing this desired quality as a distinctive and hereditary character.

It was not till ten years later that a serious criticism of these ideas was made by Hugo de Vries in his work "*Die Mutationstheorie*" (1st. Ed., Leipzig, 1901); he threw considerable doubt on the view that the advances already made in plant improvement had been really obtained by this means, and illustrated its insufficiency from theoretical considerations as well as by reference to his own experiments. It so happened that the new method of work which he wished to substitute for the old had already been carried out at Svalöf for ten years; this was shown by the hundreds of truly new varieties produced there by the new method. Let us now go into the details of this development at Svalöf.

It was not without careful criticism that Von Neergaard, the first scientific director of Svalöf, based his work on methodical selection. In particular, he endeavoured to simplify and bring under more natural agri-

cultural conditions the growing of the trial crops, which had previously been given forcing treatment; also to replace approximate estimation of the qualities of the plants by numerical determinations of weight, bulk, number and size. For this purpose he invented several new instruments and introduced new methods of research. In this way it became possible to control the ultimate variations and their relative stability. Methodical selection was thus made the subject of scientific criticism for the first time.

In 1890, when I took over the direction of the work, I had to get out as soon as possible a general summary of the observations for the subscribers. In spite of the extent and intensity of the later selection work, this report did not show the results which we had considered we could expect. Five years of rigorous and continuous selection had given only a relative uniformity, and no distinctive or stable new variety character could be reported. But the most obvious thing was that "élite" varieties, when left to themselves for a year or two, fell back into the mixed condition of the original varieties. The demand of Swedish farmers for better, and above all stable, varieties could evidently not be met in this way. The only course was to look for another method, based on firmer scientific foundations. This was the rather hopeless state of affairs at the beginning of 1891.

By the summer of 1893, however, the difficulties had already been overcome: by then a new method was in practice at Svalöf, promising the certain accomplishment of the aims which the Society had set itself. In my second year at Svalöf (1889), my botanical instinct had led me to pay careful attention to all sorts of curious forms which occurred among the old cultivated varieties. Would it not be possible, I thought to myself, to produce by growing these, new varieties as good as those at which the slow and systematic improvement of the original varieties was aiming?

The work was begun forthwith. Preparatory experiments in 1890 with 30 different types of spring wheat and vetches, continued the following year with 291 types, gave unsatisfactory results; so in 1892 I brought the number up to 1 000, comprising all the crops then under investigation: wheat, barley, oats, peas and vetches. At first the result seemed rather discouraging, but all the same I observed here and there certain winter wheats which at once opened to me fresh perspectives. Although only about 5 per cent. of the total number, they showed characteristic and uniform types, different from anything we had seen in our crops; it was evident that their value was utterly different from that of the rest. On referring to the registers of the origin, treatment, etc., of the seed with which these plots had been sown, we saw that each of these plots had come from a single ear, or (what comes to the same thing) from a single plant. This directed our attention to the importance of the individual in improvement work. This was for us quite a new idea, and from the scientific point of view inspired us with eager hopes.

To get a definite solution of the question, we made a general field trial, in 1893, of separate plots derived from characteristic individuals (2 000 different numbers). The result was most convincing: it left no doubt

that the only true point of departure for fixing the types found in the previous work would be the individual plant, and also that the only unit to be reckoned with would be the complete living plant, not (as had been considered previously) its parts, such as ear, spikelet, grain, to which different hereditary tendencies had been attributed.

*The Svalöf improvement method.* — On this new basis, the problem of improvement bears a completely fresh aspect, and one gets glimpses (we did not realize it at all at the time) of a long perspective of work along this line. We had confirmation of this as soon as the work had been carried on on the new principle for a short time.

Firstly we succeeded in showing that most of our material contained a host of independent forms, with highly divergent qualities and very varied value in farming practice. By separate culture starting from a single plant (pedigree culture), which is very easy to control, we also found that the majority of these forms were stable, only rare cases of segregation, like the results of crosses, occurring. Thus, instead of being unable to produce a single truly stable form, we can now create any number of new and constant varieties suitable for growing.

Following the old selection in mass and the methodical line of work was really equivalent to depending on chance, so that no-one knew how or when uniformity, of such paramount importance, would be reached, or even if it would ever be reached at all. But starting, as we do now, with pedigree cultures, all fear of being held up by insurmountable variability is avoided. The varieties are already in existence and fixed at the beginning of the work; the difficulty remaining is to learn to know them and appreciate their value properly. Thus the chief and only decisive work does not come till after the fixation of the already existing variety.

The long series of selection operations which previously had to be made year after year on thousands of plants and their various parts (the whole plant, different culms and ears, spikelets and individual grains) has become superfluous now that the whole plant is the unit dealt with, in comparison with all the other individuals of the same generation. The various instruments, which were till then necessary in the research work, have been set aside as museum objects, to be used at most for certain control examinations (1). Instead, the experiment field has become the centre of the estimation work.

Pedigree culture has, however, been of only secondary importance in the work at Svalöf; it has been used as a preparatory and practicable auxiliary for the classification of the material to be used. The chief interest, as well as the fundamental work, is concerned with the subsequent examination of these innumerable fixed minor species, to find what characters they contain which are of importance in practice.

The decisive characters in each species occur in enormous numbers, and in the allied forms present an extraordinarily abundant series of com-

(1) The followers of the Svalöf method in other countries do not seem yet to have reached these consequences of individual improvement, a fact which should be noted.

binations ; for this reason the comparative estimation becomes a very difficult matter, especially seeing the work must start from as large and varied a series of forms as possible, so as to have the best chance of finding the best. Since the date mentioned, the greater part of the work at Svalöf has been devoted to these problems.

A beginning was made by dividing the work among the different competent members of the staff, each one taking over a section confined to one or two species. Then, by making a careful study of his own material, with rigorous investigation and field trials, each member came to perfect himself in his special branch, and trained his eye firstly to distinguish the different forms and secondly to judge the relative value of the characters existing.

The fact that we have generally been able to draw up natural classifications, in which strictly morphological characters indicate the absence or presence of certain properties determining the practical value, has been an inestimable advantage. This allows us, even in the first search for parent plants, to advance a little in some desired direction.

For the final and only decisive estimation, namely that of the agricultural value, it has been necessary to have recourse to field trials. The fact that our Institute, owing to its intimate relation with farmers, has wholly agricultural organization and equipment, has been a great help. The *practical value* of the hereditary qualities of the numerous new forms has been determined at Svalöf exclusively by growing the descendants of élite parent plants under field conditions. To arrive at this practical value normally requires cultivation and severe criticism carried out over a long series of years.

Naturally many practical arrangements have been required in carrying out all these processes with the exactness and order indispensable in dealing with material comprising thousands of forms each year (in 1912 there were over 9 500 numbers on the trial plots). Special genealogical tables (suitable for the classification of fixed species) were drawn up, with numbers referring to parallel genealogical collections, as well as to the trial plots, the registers and the tables.

The order of work was fixed in its general lines in a few years ; thus it was shown for the first time at the General Swedish Agricultural Show in 1896, by several hundred new and stable varieties, already compared with one another.

By the great variety of constant forms thus shown to exist in our material, the improvement of field crops was built on a much wider basis than with the old method, which could only deal with a few specially good varieties. The possibility of producing valuable novelties was thereby greatly increased, as the available characters were very diverse, comprising also date of ripening, resistance to winter and to diseases, etc., all qualities of great practical value, but previously beyond the reach of improvement work.

These forms, regarded as agricultural varieties, are of a stability which considerably prolongs and widens their use, as they do not need frequent

renewal by the purchase of fresh seed. Their stability embraces a number of characters and qualities whose transmission could not be reckoned on before. As this stability affects all the plants, at any rate in the first few generations, the hereditary peculiarities become more obvious in the variety in question than in others, a circumstance which greatly facilitates estimation and control.

We may now enquire into the nature of all these minor species which have allowed the division of the old material into new and independent forms. Do they come from mutations, or from spontaneous crosses, or from both together? That mutations appear from time to time in our crops has been observed also at Svalöf. Further, it has been found that spontaneous cross-fertilization is much more frequent than was imagined. But it must not be supposed that the origin of the forms can be ascertained for certain in every case: indeed, this hardly matters for practical work, as for this it is enough to know that these forms exist. In any case it should be noted that the final results of these two different types of origin are of the same nature, in that they induce in each group of forms a multitude of systematic units, distinguished among themselves chiefly by the varying combinations of a certain, and often very small, number of characters. They are all what have been termed "minor species", or "elementary species". M. Johannsen, who later made a thorough study of them, refers to them as "pure lines"; here we have, for practical reasons, kept to the English word "pedigree."

Although our first experiments on this subject dealt with autogamous species (wheat, barley, oats, peas, vetches), our later experience with rye, clover, forage grasses, beets, etc., brought us to the conclusion that in allogamous plants there exist analogous independent minor species. In these plants, however, they naturally do not show uniformity immediately they are isolated. They require systematic treatment for several years before they acquire a satisfactory degree of purity and stability, and this can never be as perfect as in autogamous species. But it has already been shown that these forms can be used to bring about the same practical results as the others. The extension now in progress at Svalöf is chiefly intended to give scope for more intensive treatment of these groups, by fixation of varieties and practical testing.

*Crossing work at Svalöf.* — Another means of producing new forms of field crops is artificial crossing. About 1895 we were so much occupied with testing the value of all the forms obtained by the examination of the old varieties that we had no chance of taking up this question seriously. The extensive crossing experiments which we made a few years later did not give encouraging results. All the same, the winter wheat Svalöf Extra Squarehead II, eventually so famous, came from this first series of crosses.

As we accumulated rich assortments of well tried new varieties, characteristic and stable, each with some special quality of practical value, it was natural that we should try to establish other and better combinations of these qualities by systematic and careful crossing. This was undertaken from 1900 on.

Since Mendel's researches, of such fundamental importance for crossing in general, have come to light, the work in this direction at Svalöf has been greatly enlarged. In particular, Dr. Nilsson-Ehle's researches on wheat and oats have furnished remarkable contributions to the study of phenomena of this nature. The new light furnished on these problems of variation and heredity has been of considerable value for the improvement. It seems that at last Sweder is in a position to produce agricultural material for use in more northern latitudes; such varieties will combine general good qualities with strong winter-resistance or marked rapidity of ripening.

Further, the application of this method, which has been very much used at Svalöf, has shown that the combination and segregation of qualities among the products of crosses is normally so complicated as to render very illusory the idea of reaching good results by theoretical speculations. But this is a difficulty that must be put up with, as crossing offers so many chances, even if they are rather vague, of results which cannot be had in any other way.

In any case, the crossing which we do at Svalöf with our already fixed varieties, is to be considered primarily as a supplement to the older method, not as a substitute for it. All crossing work demands as a starting point pure and stable material of well-known properties, so that the first thing is to prepare such material. In the same way the subsequent development of the process of crossing depends on the continuous creation of new and better material. Consequently, for the production of the two groups of material required, our method must be used, as it is the best and most effective for seeking out the most valuable and constant types in the old mixed varieties. It should also be remarked that selection among the highly variable descendants of a cross is practically exactly like the old Svalöf method.

For a large and important part of the material dealt with, such as forage and root crops, the time for crossing is still in the distant future.

*Extent and successive development of the work.* — The crops dealt with at Svalöf from the beginning are winter and spring wheat, rye, barley, and oats; peas and vetches were started in 1889. Oats, however, were not subjected to very intensive work till the adoption of the new method in 1893, and rye not till 1900. It is true that the programme included the other agricultural plants, but no attention was given to these till further funds were forthcoming; it was thus not till 1905, when the Government allotted \$1400, that it was possible to begin work on forage grasses, clover and potatoes. Root crops will not receive systematic improvement on the Svalöf method till after the coming rearrangement of the finances to which we have already referred. It is true that some work has already been done on them, but only by the simplest pedigree method, with selection in bulk. The time is now approaching when all agricultural plants will be dealt with by our Institute.

As mentioned above, the intensive study of details which the new method involved, led to a distribution of the material in which each specialist

received a separate section of work. Thus oats and wheat were undertaken by me from 1890 to 1910, and since then have been under the charge of Dr. H. Nilsson-Ehle. Barley was under M. P. Bolin from 1892 to 1896; he was succeeded by Dr. H. Tédin, who has also had charge of the leguminous plants since 1892. M. J. Walldén had rye from 1901 to 1904; then he was joined by M. E. Ljung, who has had sole charge since 1908. M. Fr. Lundberg has had potatoes since 1905; forage crops were taken by me in 1904, but in 1907 were handed over to Dr. H. Witte, who at the same time undertook clover; root crops have been under M. J. Karlsson and others since 1907. M. Walldén has directed the work of control and germination testing since 1892.

It is evident that the final results of our work can be of practical value only under conditions similar to those in which it was undertaken, and should not be expected to be of value for very different soils and climates. In a country of the size of Sweden, which extends over  $13^{\circ} 40'$  of latitude, that is to say a north-and-south distance as great as from the south coast of Sweden to Rome, it is evident that this rule necessitates a series of trial crops in the different parts of the country. After producing at our Institute, situated in Southern Sweden, a good many varieties believed to be suitable for the centre of the country, we had every year to establish a number of such local trials. We soon found it necessary to have special branch stations, so as to undertake more detailed research, and to ensure proper control of the distant trials. We already have two such stations: one established in 1894 in Central Sweden (near Upsala), and the other near the Arctic Circle at Lulea; the latter is especially concerned with forage crops. Owing to the present state of the work, we are intending to establish several more in the more important agricultural provinces.

*Commercial collaboration.* — Most of the men who had founded the Experiment Station, joined in 1891 to form the Swedish General Seed Company; this organization undertakes to look after the new varieties belonging to the Society as they are produced, and to increase them and put them on the market, the whole being under the supervision and control of the Society. This commercial enterprise was at the outset confronted by many difficulties. But since the beginning of the present century, with the increase in number of the new varieties, it has shown continuous growth in importance and extent, so that it now has a very firm foothold and is a great help to the parent institution.

There are thus really two distinct organizations at Svalöf, completing one another perfectly in the work for the common end. This is why they are often confused abroad under the general name of Svalöf Institute, though they are perfectly distinct in both administration and finance. The Company has purchased an estate next the Society's land, containing some 1500 acres of first class fields, where most of the field trials of the Society are carried out. There are also special stores built on this property. The Company also possesses two well-equipped branches in Central Sweden.

The detailed distribution of the work and the contracts between the two organizations were approved by the Government in 1909, and are under its supervision. According to this arrangement the Company takes the new varieties as soon as they are ready, generally in amounts of only some 220 lbs.; they are then increased on the land already mentioned, under the direction of the specialists. The subsequent crops on a large scale, which naturally have to be carried out on the farms of proprietors in the different provinces, are also under the same expert inspection.

Not only the small élite progeny, but also the larger crops, are examined and approved by the Society when sent to the store; the Society also directs the cleaning and sorting, makes an exact analysis of each lot, puts its seal on the sacks and sees to the final dispatching, so that the purchaser receives each lot with a sufficient guarantee of its quality.

The varieties already handed over to the Company remain under the observation of the Society, so that new lines, fresh blood in fact, may be introduced into the Company's strains as soon as required. In this way the Society remains always responsible for the purity of the varieties on sale.

In return for these privileges the Society receives from the Company a certain annual sum, at present exceeding £2 200. Further the Company has, under certain conditions, to hand over to the Society part of the surplus profit. As the members receive only a limited dividend, it may be said that the Company also works exclusively for the public interest.

*Svalöf products abroad.* — It is evident that varieties selected and valued under a climate as northern and distinctive as ours can only be used to a very limited extent in countries with very different climates. But taking into account only the part of Europe north of the Alps, and leaving out the extremely continental climate of Central Russia and parts of Austria and Hungary, it seems that a good number of our varieties are suited to the conditions of other countries. Indeed they have already spread over no inconsiderable area. It has happened that certain early ripening varieties, such as Harnschen barley and Culdregn oats, have unexpectedly adapted themselves to very extreme conditions. Thus, to give a few examples, the new varieties of oats are much grown and appreciated especially in Russia. Most of our varieties are much grown in Germany, Denmark and Holland, and in the last few years have been taken up in England. In France the malting barleys are especially appreciated, but also the oats. In Canada and the United States a good many varieties are grown, but all limited to certain special regions. Further, isolated trials have been made almost all over the civilised world, under the most diverse conditions, with very varying results, as was foreseen.

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## Improvement of Wheat and Oats at Svalöf

by

H. NILSSON-EHLE.

Since 1900 the writer of this paper has been conducting the work of plant breeding in the Wheat and Oats Section at Svalöf; he has published a series of memoirs and notes, some theoretical, others practical, on the subject. In the "*Beiträge zur Pflanzenzucht III*" the writer gives a resumé of his work on winter wheat. A similar summary, in German, of the work accomplished on oats, with complete bibliography, is in course of preparation.

The present article proposes to give the most important results of all this work. The chief object aimed at during these twelve years has been to provide farmers with improved varieties. Secondly, so far as time permitted, an endeavour has been made to develop further the principles and methods of practical breeding, by giving in a series of publications, partly of a purely theoretical nature, information on the bases of breeding, variation and heredity.

*Practical breeding* has resulted in a series of new varieties which have been handed over to practical farming, but only such varieties were distributed which in practical experiments yielded a heavier crop than those previously grown or otherwise revealed themselves superior.

These improved varieties were selected only according to yield and to direct valuation of their good qualities, and *not* according to an indirect opinion based upon a supposed correlation. An increase in the number of varieties grown in Sweden was vigorously avoided: the new varieties were so distributed as to replace the varieties previously grown, and no greater number of varieties were produced than those required by the very various climatic and other conditions obtaining in Sweden. The most important new varieties launched between 1900 and 1912 are: among winter wheats, *Extra Squarehead II* (1909) (1) and *Sun wheat* (1911) for the South of Sweden, and *Poodle wheat* for Central Sweden; among oats *Conqueror* (1908) for the white oat districts of the South of Sweden and *Black Bell II* (1909) for the black oat districts of Central Sweden. All these varieties spread widely during the succeeding years, not only in Sweden, but to a certain extent in neighbouring countries also, and have retained their position in practical farming. Besides the above, some few varieties adapted to more special conditions were distributed (*Fyrås* oats and others).

(1) The date in brackets is that of the year in which the varieties were first placed upon the market and mostly in great quantities.

The new varieties have replaced the older ones : Extra-Squarehead II has completely replaced Extra-Squarehead I, the yield of which was considerably inferior (about 15 per cent) ; the Grenadier variety is also destined to disappear gradually. As for oats, the varieties Hvitling and White Probsteler, as well as Black Bell I formerly bred at Svalöf, have been withdrawn and they are no longer sold at Svalöf. Thus an increase in the number of varieties has not taken place. A few other varieties which show further improvement in certain directions have been given out to be grown on a large scale and will within a very few years be placed on the market ; thus among oats, Crown and an early cross for the North of Sweden, and among wheats a very productive cross for South Sweden (o8or) and Thule for Central Sweden. The multiplication of the most recent crosses, which represent the highest mark at present attained in improvement, is being carried out.

The above new varieties have been obtained partly by selection from native cereals and partly—during the last few years principally—by crossing. By mutation, on the other hand, no new improved variety has been obtained. The artificial crosses were made with the object of combining in the best manner the principal valuable qualities, such as resistance to cold, lodging and diseases, productivity, and the like, and at the same time of increasing these qualities in the desired direction. In the attainment of these aims continual progress has been made.

The work concerning the theoretical basis of breeding referred especially to the nature of the hereditary variation in cereals and to the manner in which several qualities, especially those of practical importance, are inherited. With this object the writer began in 1900, the year in which the great discoveries of Mendel were known, comprehensive experiments in crossing; the results have hitherto been only partially published in the two principal works of the years 1909 and 1910, as well as in a series of shorter papers.

The first result of these researches agreed with those of Von Tschermak, Biffen, Spillman, De Vilmorin, Howard and others, namely that all the qualities of cereals, after crossing, show a sure segregation and reciprocal independence and form all kinds of combinations. The so-called "elementary species," "constant forms," "pure lines" of the mostly self-pollinating cereals are not, as De Vries thinks, independent unities obtained by progressive mutations, but various *homozygotic combinations* of segregating qualities. The crossing of two constant forms may give rise to an immense variety of new forms which may be maintained constant ; it suffices thus to have only *one* such cross to render manifest all the diversity of constant forms or lines of a native breed. In other words, by the crossing of only two constant forms, a whole "population" of new forms and lines is obtained. As spontaneous crossing occurs frequently in self-pollinating cereals the nature of the so-called elementary species or lines as combinations of crosses becomes quite clear.

This fact being recognized, artificial crossing became naturally a specially important principle in breeding. The object of breeding was no longer limited to the selection of the existing homozygotic combinations, but was exten-

ded to the obtaining of always better combinations by appropriate crossing; and in this connection not only the crosses between older and more different varieties, but also between lines, partly of the same old breeds.-

As for the magnitude of the differences between the homozygotic combinations ("genotypes" of Johanssen), it was shown in connection with researches on the variation of native breeds (*Sveriges Utsädesförenings Tidskrift*, 1901, pp. 154-176; 1908, pp. 165-170; *Botan. Notiser*, 1907, pp. 113-140), as well as upon the segregation of qualities after crossing, that in respect of most qualities, especially of the practically important ones, the genotypes are so numerous and so closely connected that they form fully continuous lines; the result is that by cultivating separately plants of similar aspect, an apparently uniform group of individuals can be split up into different descendants, into lines hereditarily different. Among the genotypes one may, it is true, isolate well characterised "elementary species" from a native breed, but a more minute analysis of the native breed reveals that they are connected with each other by the finest transitions, and the differences are only in the rarest cases of a qualitative "botanical" nature, and this especially for those qualities with which practical breeding deals. Further, in quite similar morphological types the physiological characters most important in breeding, such as productivity, resistance to disease, lodging and cold, early maturity and the like, may be essentially different. In consequence of this, "separation by lines" instead of "separation by forms" was introduced in the years 1901-03. Instead of separating out from old strains a relatively limited number of morphologically characterised forms and fixing them by continued selection, while further improving them by utilizing the new variations which appeared, as had been done until then at Svalöf also, further improvement in this direction was abandoned because no good results had been obtained (1); in its place a more extensive improvement of old varieties was resorted to, by selecting for separate cultivation from each variety to be bred, the greatest possible number, sometimes several hundreds of plants, without caring whether their outer appearance was the same or not, and their descendants were compared as to their production and practical value. From these descendants or lines the best were finally picked out. A further selection for the better fixation of the characters of the finally selected lines was not usually made, because with this separation of lines from old breeds of mostly self-pollinating cereals the lines in general were already sufficiently fixed. This is explained by the fact that by continued selfing only the homozygotic combinations can be maintained in the long run, as Mendel had already shown.

The descendance resulting from crossing was treated in a similar manner, only the separation of lines was frequently repeated. By this method of separation by lines all the new improved varieties have been bred.

(1) Further improvement was sought for by means of suitable crossing.

In the attempts made to obtain desired combinations from crosses, it must be noted in the first place that most of the practically important characters are very probably exceedingly complex "construction characters" (Konstruktionseigenschaften). After crossing two constant forms or lines which represent two degrees of a character, e. g. size, resistance to rust or cold, time of maturing, the segregation is always complicated and can only be ascertained by the separate cultivation of all the F<sub>2</sub> plants and by the comparison of the average characters of their offspring in F<sub>3</sub>.

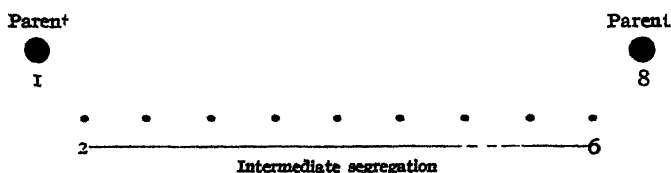
With regard, for instance, to the medium height of plants, the constant oat plants vary very much; there are taller and shorter lines in a whole series of degrees which could be represented by:

1      2      3      4      5      6      7      8      9      10.

Crosses between any two tall and low constant lines do not give (or only in the rarest cases) the simple Mendelian segregation. The segregation does *not* take place in the following manner:

Cross 1×8. F<sub>2</sub>:  $\frac{1}{4}$  homozygote 1,  $\frac{1}{2}$  intermediate heterozygote,  $\frac{1}{4}$  homozygote 8  
 " 1×5. F<sub>2</sub>:  $\frac{1}{4}$  homozygote 1,  $\frac{1}{2}$  intermediate heterozygote,  $\frac{1}{4}$  homozygote 5  
 " 5×8. F<sub>2</sub>:  $\frac{1}{4}$  homozygote 5,  $\frac{1}{2}$  intermediate heterozygote,  $\frac{1}{4}$  homozygote 8.

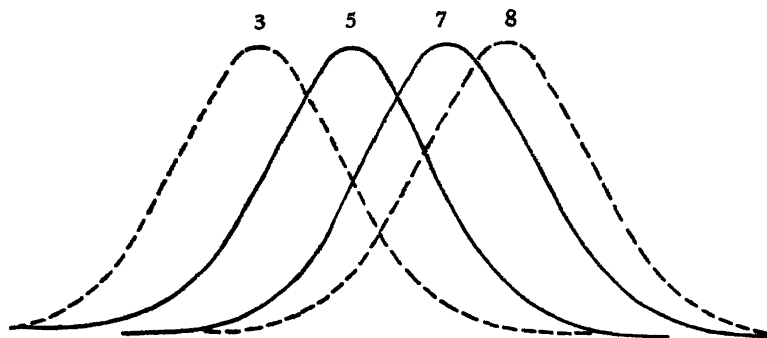
On the contrary, the segregation after crossing for instance 1×8 gives a whole series of gradations, among which those of the parents are very rare or may be completely wanting, so that the whole segregation is intermediate and does not attain the limits given by the parents:



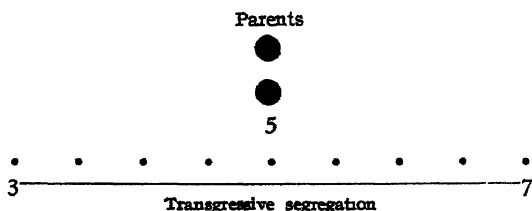
Inversely, when two medium slightly different lines, such as 5 and 7, are crossed with each other, the segregation is very often, and sometimes considerably, *transgressive*, that is degrees appear which exceed the limits of the parents in one or in both directions; lines are formed which on the average are taller or shorter than their parents and which on further cultivation show that they possess this character as a true hereditary trait:



As every hereditary line shows certain fluctuations in its modifications, which can sometimes be very considerable, the transgressive segregation might perhaps be better represented as follows :



The fact is also important that lines that possess the *same* degree of a character give on crossing segregations which form transgressive lines :



This is the manner in which all the quantitative practically important characters that the writer has investigated in wheat and oats behave ; such, for instance, are the degree of resistance to cold (cf. *Zeitschrift für Pflanzenzüchtung*, Vol. I, 1912, pp. 3-12), early maturity (cf. *Compte rendu de la IV conférence intern. de génétique à Paris*, 1911, pp. 136-155 : Paris, 1913), resistance to rust and to lodging, productivity, size of grain. The extensive researches of Tedin on barley (short notice in *Popular Naturvet. Revy*, 1912, p. 216) show many quite similar results, in regard to early ripening, degree of emergence of the ear from the sheath, and so forth. Sometimes the transgressions after the crossing of constant lines of medium characters are very considerable (e. g. the time of ripening of oats).

On the basis of all the facts, agreeing for several characters, and concerning the behaviour of segregation not only in F<sub>2</sub> but also in the following generation (in F<sub>3</sub>), it is to be noted among other points that the segregation in certain descendants is considerably greater than in others. The writer has suggested the theory that all practically important characters are of a complex nature ("Konstruktionseigenschaften") determined by inner Mendelian factors, which through various combinations, form the long series of hereditary constant gradations.

The writer starts from the behaviour, which in principle is quite the same, of other characters, which submitted to the analysis of crossing have revealed themselves undoubtedly polygenous, that is determined by several Mendelian factors.

The most important are the factors which operate in the same direction (gleichsinnige Faktoren); a character, e. g. the red colour in wheat, may be built up by several factors, each of which has the same exterior effect, that is, each of them possesses the power of determining the appearance of the character. (For this phenomenon Lang proposed the name "polymerism" and Plate that of "homomery"). The black colour of the glumes of oats may be determined by two factors, instead of by only one as is generally the case. Then in F<sub>2</sub> the segregation 3 black: 1 white according to the simple Mendelian scheme does not take place, but instead the segregation 15 black: 1 white. There are two black factors, *A* and *B*, each of which is capable of producing the black colour. After crossing with a white variety (*AB ab*), a black F<sub>1</sub> plant is formed, which produces the four kinds of gametes *AB*, *ab*, *aB* and *Ab*; from the 16 combinations of these gametes only one (*ab ab*) will be white, because all the combinations into which either one or both of the factors *A* and *B* enter will be black. The ratio of 15 black: 1 white in F<sub>2</sub> is thus produced, as may be seen from the following figure:

♀	<i>AB</i>	<i>Ab</i>	<i>aB</i>	<i>ab</i>
♂				
<i>AB</i>	1	2	3	4
<i>Ab</i>	4	5	9	12
<i>aB</i>	5	10	7	13
<i>ab</i>	11	14	15	16

Of the 15 black F<sub>2</sub> plants 7 (1-7) remain constantly black in F<sub>3</sub>; 4 (8-11) segregate again in the ratio 15 black : 1 white, and 4 (12-15) in the ratio 3 black : 1 white.

Segregation follows the same law when three factors operating in the same direction are present, as in the red colour of the grain in wheat. Crossing of a three-factor red line, *ABC*, with a white one, *abc*, produces in the F<sub>1</sub> plant eight kinds of gametes *ABC*, *ABc*, *AbC*, *aBC*, *Abc*, *aBc*, *abC*, and *abc*. Of the 67 possible combinations 63 are red and only one (*abc* × *abc*) is white. In F<sub>2</sub> the ratio is 63 red : 1 white and in F<sub>3</sub> it obeys the law as expected.

When four factors in the same direction are present, the ratio in F<sub>2</sub> is 255 : 1; the writer considers it highly probable that this is the case with the ligule character in oats.

In the crosses of two lines, each of which possesses an independent factor operating in the same direction (*Ab* × *aB*), the offspring will include some combinations in which both factors enter and others in which they are absent. Through crossing two red-grained wheat lines which had exactly the same appearance, the writer obtained in F<sub>2</sub> the segregation 15 red : 1 white and in F<sub>3</sub> the further segregation as expected. (*Berichte der deutschen botanischen Gesellschaft*, 19, 1911, pp. 65-69):

	red		red	
	<i>Ab</i>	×	<i>aB</i>	
red	red		red	white
<i>AB</i>	<i>Ab</i>		<i>aB</i>	<i>ab</i>

In the same way the crossing of two very similar common oats, each of them possessing a factor for spreading branches (*Ab* × *aB*) produced in F<sub>2</sub> and F<sub>3</sub> the one-sided oats (*ab*) as well as forms (*AB*) with branches more divergent than in either parent, as expected.

In this manner apparent novelties, apparent mutations, arise.

The writer has found factors having the same direction in determined numbers, in a series of quite different characters of wheat and oats, not only in the *colour* (of the glumes in oats, of the ear and grain in wheat), but also in the *size* and *form* (length of the internodes in the ears of wheat, type of panicle in oats) (1), as well as in several other characters (presence of ligule in oats).

Factors in the same direction are often cumulative, that is, their effects add up, so that the character is more strongly impressed the greater the number of factors present. By means of several combinations of the factors, especially when heterozygotes are taken into consideration, a continuous variation of a hereditary nature may arise.

(1) The common oats possess several factors in the same direction for distant insertion of the branches; on crossing with Tartarian oats (*Avena orientalis*), the one-sided oats in F<sub>2</sub> do not amount to a quarter of the individuals, but to a much lower proportion.

The above-described behaviour of the practically important characters (resistance to cold, rust, etc.), giving intermediate and transgressive segregation, is easy to understand by means of the theory of several factors working in the same direction and of a cumulative nature. Already with four factors, on crossing the extremes ( $ABCD \times abcd$ ) these extremes will be formed only once each in every 256 individuals; all the other 254 individuals are intermediates; in a limited number of individuals *the whole segregation is intermediate*. The individuals of medium character will be the most numerous, because the gametes with medium number of factors (two factors) are the most numerous. By means of the curve of combinations (Kombinationskurve) of several factors operating in the same direction the origin of a normal curve of frequency of hereditary variation is at least partially explained (1).

The transgressive segregation of practical characters after crossing two intermediate constant lines is to be attributed to the presence of several factors operating in the same direction in these lines, in the same way as the crossing of two similar red lines ( $Ab \times aB$ ) gives rise to partly deeper red ( $AB$ ) and partly white ( $ab$ ) as transgressions.

The principle of the action of several factors in the same direction represents, for practical breeding, the principle of the work of continuous combination.

In winter wheat, the object aimed at is to combine always in a better manner the probably many inner factors which determine the practical characters of productivity, resistance to cold, to diseases and to lodging, etc.; and little by little good progress has been achieved in the desired direction (see above), even if the chief aim of the work, namely to unite the productivity and other characters of the best West European varieties with the resistance to cold of the native Swedish varieties, is still far from being attained.

Further, an endeavour is made with both wheat and oats to obtain an increase in productivity by crossing two varieties, equally productive, which might eventually be the combination of several factors. In this direction some results have already been obtained, with winter wheat (Cf. *Sveriges Utsädes förenings Tidskrift*, 1912, pp. 317-318) and with oats (result not yet published).

The principle of continued combination work in practical breeding is not based only on the principle of factors operating in the same direction, but in general on the multiplicity of the inner factors which determine the exterior characters, and the complexity of the segregations caused by it. Even when only *one* factor working in a particular direction (e.g. for black glumes in oats) is present and in F<sub>2</sub> the segregation is 3 black : 1 white,

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(1) By the term "Combination" German writers (Baur, Schinz) mean a variation produced on the one hand by segregation of hybrids and on the other by new combination of "hereditary units". Cf. BAUR, ERWIN: *Einführung in die moderne Vererbungslehre*, pp. 186-187. Berlin, 1911.

the segregation is by no means simple, because the black homozygotes may show very various shades of black, which points to the existence of modifying factors (reinforcing or inhibitory factors). A similarly modified segregation is very frequent in several characters of wheat, as well as of oats; the writer is conducting special experiments for the investigation of this question. He has recognised quite special inhibitory factors in both wheat and oats (*Zeitschrift für induktive Abstammungs- und Vererbungslehre*, 5, 1911, pp. 1-37), and it is very probable that these inhibitory factors also are not simple, but series of factors, and that there may be inhibitory factors operating in the same direction.

Considering this multiplicity of inner factors and the consequent possibility of improvement — though it may be slow and gradual — by the combination of these factors, the writer has come to the conclusion that together with the selection of already existing combinations, systematic artificial continuous crossing will in the near future play the most important part in plant breeding.

The writer has several times recognized spontaneous variations in homozygotic lines (*Zeitschrift für induktive Abstammungs- und Vererbungslehre*, 5, 1911, pp. 1-37; *Verhandlungen des Naturforscher Vereines in Brünm*, 50, 1911, pp. 139-156). These spontaneous variations are always due to the disappearance of Mendelian factors (mutations by loss), and nothing new has been produced in the cases hitherto observed. Nevertheless, the writer considers it not impossible that there may be mutations by loss which will prove valuable to breeders. For the investigation of this question also the writer has extensive experiments in course.

#### DETAILED PUBLICATIONS ON THE BREEDING WORK OF THE WRITER.

NILSSON-EHLE. 1. Ueber die Winterweizenarbeiten in Svalöf in den Jahren 1900-1912, (Work on winter wheat carried out at Svalöf from 1900 to 1912). — *Beiträge zur Pflanzensucht*, III, pp. 60-86. Gives a complete list of the writer's 31 publications on wheat.

2. (Experiments in crossing oats and wheat). — I. *Lunds Universitets Årsskrift* 1909, N. F. Afd. 2, Vol. 7, No. 2, pp. 122. — *Ibid.*, 1911, N. F. Afd. 2, Vol. 7, No. 6, pp. 84.

3. (Annual Reports on the work on oats and wheat at Svalöf). — *Sveriges Utsädesförensings Tidskrift*, 1906-1912.

### The Present State of Motor Cultivation in Germany

by

Dr. GUSTAV FISCHER,

*Professor at the Royal Agricultural Higher School in Berlin.*

Farmers who possess large extents of heavy soil can use to advantage the double-engine system of steam ploughing in which a balance plough is hauled by a wire rope alternately by each engine. The increase in the



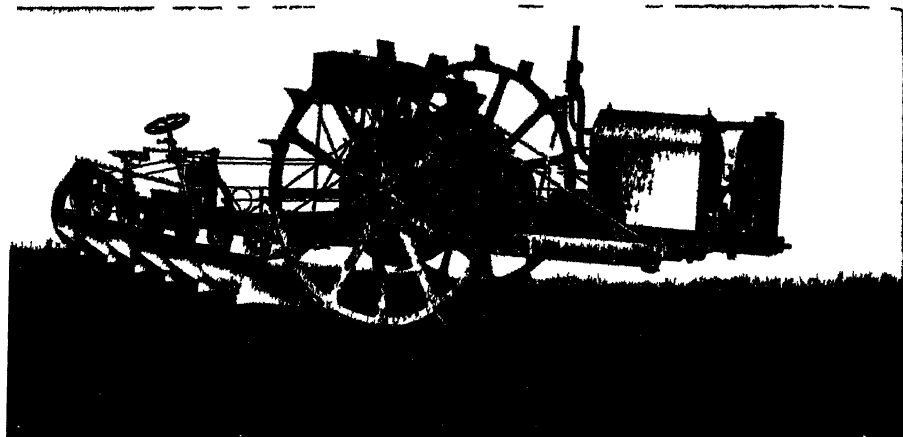


Fig 1  
Stock's plough

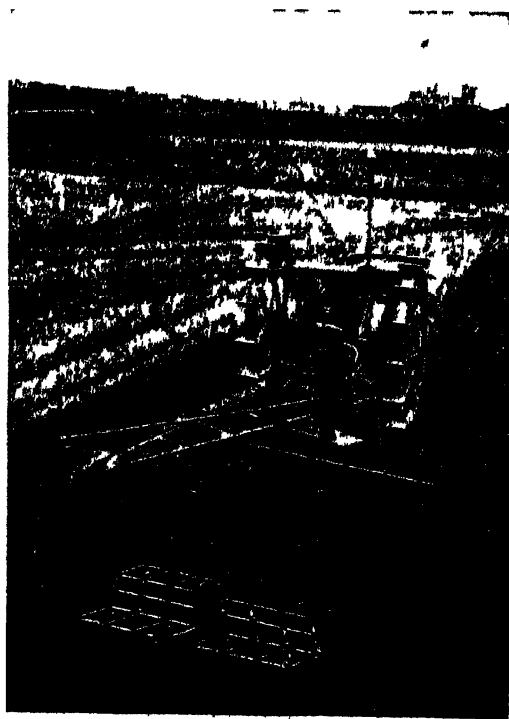


Fig 2  
Stock's plough and harrow

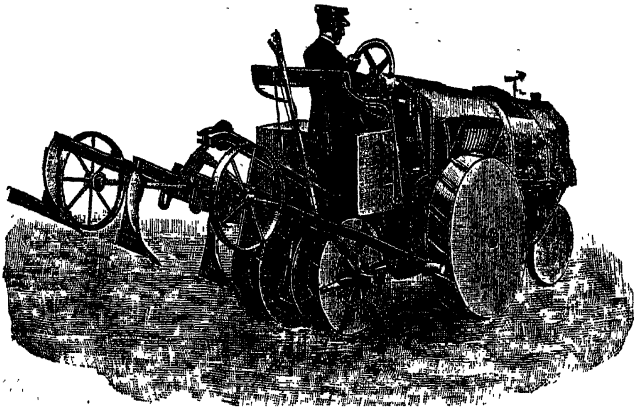
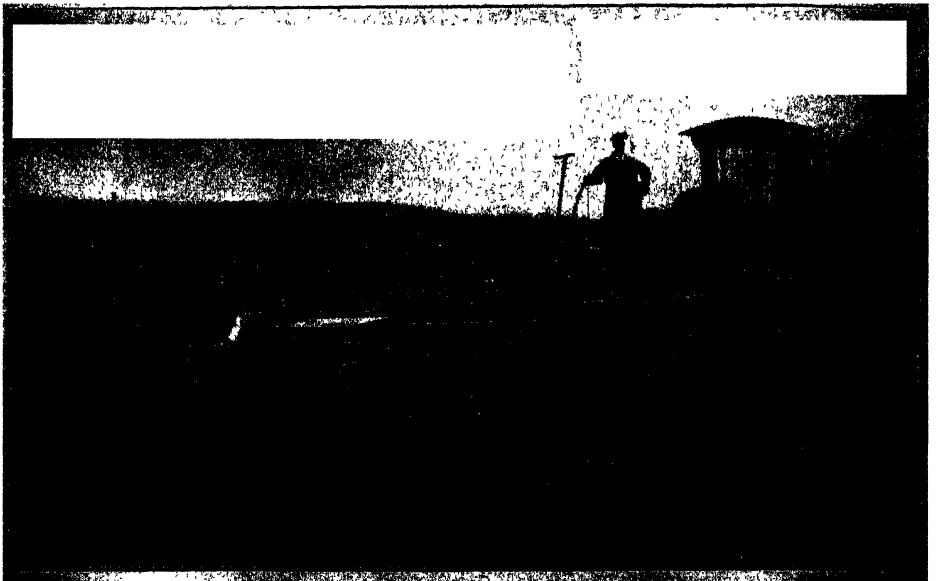


Fig. 3  
Gustav Pöhl's motor plough.





number of farms in Germany which use steam ploughs, namely from 836 in 1882 to 2995 in 1907, shows that the need of mechanical aid in the tillage of the soil has steadily increased and that at the same time the machine industry has satisfactorily met the demands made upon it. But the figures given for 1907 are exceedingly small in comparison with the total number of farms. In fact they represent only a little over 10 per cent. of the farms covering upwards of 250 acres. All the other farms had to plough their land in that year and the three following years with teams, because the electric outfits that were used in some few farms might have been counted on the fingers of one hand.

At the same time the want of a cheap, mobile, mechanical plough, suited to small farms and to the shallow tillage of light soils, was all the more keenly felt as the conditions of labour grew worse and the advantages of careful tillage were more universally recognized. The hope that the use of oil engines would soon solve the difficulty, which the cumbersome steam engine could not, seemed at first impossible to be realized, and several eminent engineers considered the problem of motoculture as an insoluble one. But the laborious and expensive experiments of Robert Stock, a man who had much practice in mechanical technique and who had learned, on an estate he had then bought, to appreciate the difficulties of tilling the soil, resulted in a practical solution of the problem. In the spring of 1910 he was in a position to put before the public the first motor plough.

With a few unimportant modifications, several hundreds of Stock's motor ploughs are now used and, under suitable conditions, work satisfactorily. These ploughs weigh between 4 and 4  $\frac{1}{2}$  tons. They are so constructed that almost the whole of their weight is carried by the driving wheels, thus producing the necessary friction between the wheels and the ground. The wheels are 7 ft. 4 in. in diameter and only 6  $\frac{1}{3}$  inches wide; they are furnished with lugs which project on both sides about 4 inches beyond the tyres of the wheels, so as to allow sticky soil to fall off easily. These lugs are not arranged transversely, but somewhat inclined, so that they penetrate into the soil obliquely, thus ensuring against skidding and facilitating their coming out of the ground. In order to utilize to the greatest extent the weight of the machine on the driving wheels, the four-cylinder benzine motor is situated well in front so as to counterbalance the plough shares with their frame placed at the back. The steering wheel at the tail of the machine bears thus a very small part of the weight.

Stock's plough met with great success for its several good points. It is simple in construction, for the motor and the implement form a single and indivisible whole. Nor is its working less simple. The driver sits in a light seat, with the steering wheel, the crank for regulating the depth of the shares, and the levers for driving the motor close to his hands; by means of one foot lever the motor is thrown into gear and by another one the regulator of the depth is disconnected. The machine is further simplified by there being no device for reversing or for changing its gear when once started at a certain pace. This simplicity, however, is attained at the expense of

some advantages. The change in speed can only be obtained by changing the gearing, which can only be done when the machine is not working, and besides requires a certain amount of time.

A test of Stock's plough made by the writer in 1911, on behalf of the Colonial Committee, gave the following results as to work done and consumption of fuel (1). On a mild loamy sand the motor plough worked nearly 1.73 acres in one hour to a depth of 6  $\frac{1}{2}$  inches. The field was 700 yards long and of a convenient shape. Another day 1.48 acres per hour were ploughed to a depth of 8  $\frac{3}{4}$  inches. Lastly, in consequence of several stoppages due to the field not being sufficiently dry, only 0.99 acre was ploughed per hour to a depth of 7  $\frac{1}{4}$  inches. The consumption of benzine was under the favourable conditions of the first day only 12.3 lbs. per acre, but on an average in practice it ranges from 14.3 to 19.6 lbs. per acre. The power developed, as registered by a brake dynamometer, was 33.9 H. P.

The technical success of this machine was a stimulus to other inventors to similar attempts and to further improvements. Most of them considered the want of the means of changing the speed, and especially of reversing, as disadvantages, and it must be recognized that this is true. On quite level and uniform ground a change of speed is not necessary, but when slight undulations or depressions are to be traversed it is a drawback to have to keep up the same slow pace that has to be taken for going up hill according to the power of the motor. Still more important is reversing, for as soon as the plough is brought up by a big stone, or through a slight error of the driver by any other obstacle, the machine generally requires the assistance of horses to shift it; while if it could back it could easily disengage itself. Recently, the firm Stock has been providing its ploughs with reversing gear if demanded.

Since 1910 a number of motor ploughs have been invented, but only a few of them have survived, and deserve to be mentioned. Very similar to the Stock plough is the Wandeler-Dohrn plough of the German Motor Plough Co. (Deutsche Kraftpflug Gesellschaft); but it has reversing gear and two speeds, and its management has been cleverly simplified. The shares are fastened to a special frame which can be easily lifted and lowered, being fitted into a main frame.

The machine of the Gast Motor-plough-building Co., Ltd. (Gast Motorpflugbau G. m. b. H.) in Berlin (2) is very light. Both the tractor and the ploughing outfit are mounted on spring frames. The tractor weighs only about 2  $\frac{1}{4}$  tons. The Gast plough has reversing gear and various speeds ranging from 2.8 to 5.3 miles per hour. The separation between the motor and the ploughs which has been made in this machine has been followed by most builders. It facilitates the use of harrows, mowers, root lifters and similar machines, and is absolutely required by many farmers. At the

(1) *Verhandlungen der Kolonialtechnischen Kommission des Kolonial-Wirtschaftlichen Komitees*, 1911, No. 1, p. 41 et seq., No. 2, p. 62 et seq.

(2) Since the above was written the Gast Co. has

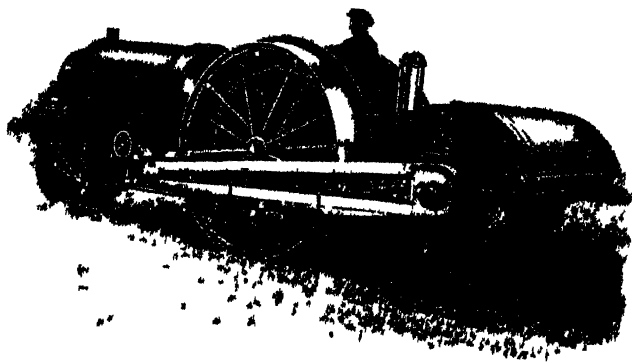


Fig 5  
Heinrich Lanz's revolving-hoe ploughing machine

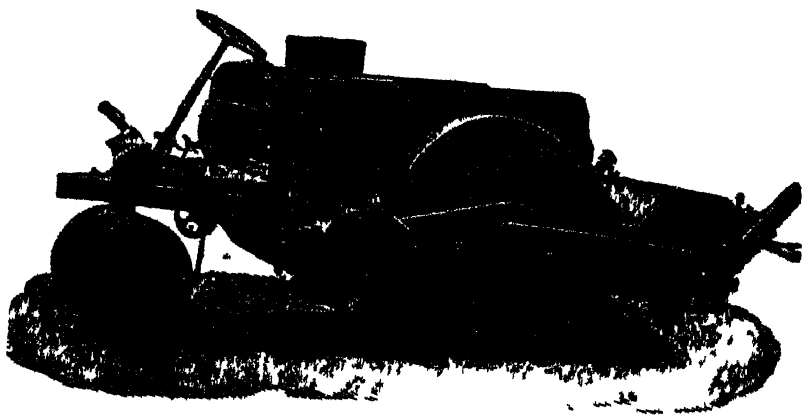


Fig. 6  
Meyenburg's motor tilling machine



same time it must be recognized that the unity of construction of the Stock plough is one of its principal merits, because, setting aside all secondary considerations, it is built exclusively for ploughing. Besides, those who possess Stock ploughs have already devised methods for attaching other implements instead of the plough shares.

Of quite special build is Pöhl's patent motor plough, devised by Gustav Pöhl, of Gossnitz (Saxe-Anhalt); this carries in front of every plough share a revolving coulter, consisting of a sharp disk with projecting blades which have the object of easing the work of the plough by breaking up the soil and thus diminishing its resistance.

This feature makes Pöhl's plough resemble somewhat those machines (*Landbaumotoren*) which till the soil not by means of plough shares but by revolving hoes. Among these the one that has been most tested is the one invented by the Hungarian Kőszegi, the building of which has been undertaken by the firm Heinrich Lanz, of Mannheim. Lanz's machine has now assumed a form so different from Kőszegi's original, that only the manner of working has remained the same. The driver sits on a three-wheeled vehicle resembling a motor car and controls the whole machine. The shaft, with the disks that bear the cross-blades, is situated at the hinder end and is driven by an endless chain; it can be raised or lowered by the driver by means of a hydraulic apparatus.

Somewhat similar is the v. Meyenburg's "Landbau motor" of the Motorkultur Joint Stock Company, Bâle, built by the Siemens-Schuckert works. It differs from the Kőszegi machine chiefly in the elasticity of the hoes, which are not of rigid sheet iron, but consist of curved claw-like steel wires. The advantage of the elastic hoes is claimed by the inventor to lie in their being able to avoid stones and other dangerous obstacles, and consequently to last longer than rigid hoes and to require less power.

The experience gathered as to these revolving disk machines is as yet insufficient to pronounce final judgment upon them. As indeed none can yet be pronounced upon motor ploughs, in spite of the fact that these are used in much greater numbers. Present experience shows that the revolving disk machines require more power than motor ploughs. On the other hand the work they perform is more intense, since they work the soil like milling machines and reduce it to a fine tilth. They accomplish at once without requiring any further assistance, what frost and changes of weather do after ordinary ploughing. Such a finished tilling is well worth a few pounds of benzine, and it would be unjust to make capital of this greater consumption against these machines. Possibly Meyenburg's machine, owing to its elastic hoes, may be made so much lighter than motor ploughs that the saving in weight will bring about a notable saving in power, as the work consumed in running the machine varies with its weight. But just this machine is one of those that has been tested least. It is proposed to build it in various sizes down to 8 H. P., and in breadths ranging, according to the depth of the work, from 32 to 56 inches.

The reason for the more favourable conditions, at least in theory, of work of the revolving tilling machines as compared with those of the motor

ploughs, lies chiefly in the fact that their working disks revolve in the same direction as the driving wheels and that while working they propel also, or at least even in the most unfavourable conditions they do not act as brakes as plough shares do. The fear that the finely divided soil would soon be compressed again has in no case been justified. Manures and stubble get distributed throughout the tilled layer, and only in soils overrun with couch grass are unfavourable results to be apprehended from the possibility of increasing the infestation by the couch grass being cut up into so many small pieces. From the point of view of tillage there are hardly any objections to be raised against these machines, but their technical execution is not yet quite satisfactory. For this reason Meyenburg's machine is not yet on the market, and Lanz has had some lack of success with his machine in 1912. On a heavy soil it did not work beyond a certain depth, because the motor, in spite of its 60 H. P., was not strong enough and the surface of the ground was left uneven in the wake of the machine owing to unequal depth of work, due to the disk shaft not being properly supported. Both inventors are actively occupied with the improvement of their machines. Lanz's machine in a modified form has already worked very well this spring.

For soft soils such as moors, most motor ploughs are too heavy. This is especially true for American machines, which work satisfactorily on many other German soils. They are all built on the tractor system to allow hauling other implements besides ploughs. The ploughs are so arranged in the American machines that a man can stand on a kind of platform and regulate the depth of the shares while the machine is running. In some machines each ploughshare is independent and yields if an obstacle is encountered; in others they are united in groups, as in the Moline Plow Company's plough, in which they are in two groups of four. For greater depth of work (8 inches and upwards) American builders prefer disk ploughs; it is true that these do not leave the bottom of the furrow smooth, but they penetrate easily into the soil even under difficult conditions, as for instance when long stable manure has to be ploughed in.

American tractors have no very projecting grips on the tires of their wheels, which are very broad, but only low obliquely set lugs. The most frequently used tractor of the International Harvester Coy. (Ithaca Tractor), in its largest size, has hind wheels 6 ft. 4 in. in diameter and 24 in. wide, which can be further widened by additional tires 14 inches wide. Its motor is about 45 H. P., and its weight 9  $\frac{1}{4}$  tons. The form of the wheels is well adapted to hard soils, and allows of the machine passing from the fields to hard soils without being obliged to unscrew the grips or to put fenders between them to prevent their being damaged, as is the case with Stock's plough. But on soft soils the wheels have not enough grip, and they begin to skid in places where Stock's plough continues to go ahead. The great weight of the machine is also a difficulty in soft soils. As traction engine the machine can naturally be used without any alteration.

In order to work with motor ploughs on moors, recourse must be had to haulage with steel ropes, but instead of steam engines, oil motors are

used, as smaller power is sufficient. Hartmann, of Berlin, builds his plough on the one-engine system, and fixes the drum on which the tail rope is paid out on an iron carrier mounted on rollers which is anchored in the ground. In Neukirch's system (Löckritz engine works) there are two portable engines of 22 H. P., each of which drives one drum which alternately hauls the cable pulling the plough and the cable anchored at the other end which serves to move the engine forwards. The experiments carried out with the Neukirch plough on the Pomeranian moors have yielded good results.

The results hitherto obtained with motor ploughs in Germany do not allow of a final judgment being passed on them, but they have confirmed that for light and medium soils some very useful machines exist. Gradients above 1 in 10 offer considerable difficulties, because the machines require for their own propulsion so much power that not enough is left for actual work. Stones also, when they are numerous and big, are a serious hindrance. Many American ploughs have safety appliances in the shape of wooden pegs which break when the plough runs against a large stone, and the share and the beam pivot round. But when there are many stones the pegs break so often that the amount of work done is diminished. On hard soils the American tractors work best, while on soft soils ploughs of the Stock type are preferable. Depths of work reaching to 8 or 10 inches can be obtained on most soils; greater depths are not so sure. Disk ploughs seem to penetrate more easily to considerable depths than the others; but even Stock's ploughs have reached, according to the statements of practical men, as much as 12 to 14 inches and even 15  $\frac{1}{2}$  inches. I give these figures, however, with reserve.

The amount of work done by a motor plough may be set down at an average of  $1\frac{1}{4}$  to  $1\frac{1}{2}$  acre per hour; on heavy soil and with deep work it sinks to about 1 acre. The consumption of benzine, borneoxol or benzol costs, under average conditions, 3s 11d to 5s 7d. Benzol costs 15s per cwt. and does not work so cleanly as benzine which after combustion leaves no residue, but is dearer. Unfortunately the prices of liquid fuel have constantly risen and are much less steady than those of coal, which is besides cheaper for the same amount of power developed. These data bring an element of uncertainty into the calculation of the profitability of these systems of ploughing, and still more is this the case with the figures representing wear and tear and repairs. The data supplied by practical men vary within very wide limits; motor ploughs are still too recent to allow of their durability being determined. Several owners have already had to pay considerable renovation expenses. It is usual to calculate for interest, amortization and repairs 25 per cent. of the purchase price, which amounts for Stock's and similar ploughs to about £830, for the large Ihace ploughs £1130 and for the smaller ones £735. Such figures will have to be reckoned with, even with good and well schooled drivers, because the machines have to work under unfavourable conditions and the quick-running motors (Stock with 720 revolutions) soon wear out. Ihace has a motor that makes only 240 to 335 revolutions, but it appears doubtful whether its construction equals that of German motors.

Within the next few years the question of profitableness will be cleared up. In the meantime it is certain that for the shallow and moderately deep ploughing of the light and medium soils so prevalent in Germany motor ploughs assist very materially by the careful and seasonable tilling which can be done with them, and in overcoming the difficulties which the unfavourable labour conditions oppose to the increase of the total yield of crops.

## **Report on the Diseases observed at the Phytopathological Laboratory of the National Museum of Rio Janeiro**

by

ANDRÉ MAUBLANC,

*Chief of the Laboratory*

With the exception of some investigations concerning the most important economic plants, chiefly coffee, it may be said that phytopathology has been hitherto much neglected in Brazil. Certainly some naturalists have collected abundant material which allowed an idea, though a somewhat incomplete one, to be formed of the especially rich mycological flora of the country; but this material has for the most part been studied in Europe, and the specialists who dealt with it could not direct their researches beyond the morphology and the system of the fungi on cultivated and spontaneous plants.

Since its foundation, still quite recent (1910), the Phytopathological Laboratory of the National Museum of Rio Janeiro has been obliged, through lack of proper installation, to limit its efforts to the scientific determination of the diseases which it examined; but the definitive organization of this Laboratory, which is now an accomplished fact, will allow of more exhaustive phytopathological researches being made and of dealing with biological questions, which are the most important for the practical conclusions which may be drawn from them as to treatment.

Still, even now it appears to me to be interesting to state briefly which are the most important and most widely spread parasitic fungi on cultivated plants in Brazil, almost exclusively in the Southern States: from Rio de Janeiro to Rio Grande do Sul, the only region from which the Laboratory has sufficient material. This information may be of real importance, as it is only by the comparison of similar statistics published in the various countries that an exact knowledge will be acquired as to the distribution of the principal diseases, and this seems indispensable, if it is intended by an international understanding to arrive at legislation capable of reducing to a minimum the danger of introducing into a given region diseases which are still unknown to it.

**COFFEE.** — The coffee plant, which is of capital economic importance to Brazil, is, especially in the State of São Paulo, almost immune from plant parasites of any importance. Certainly the leaves present some spots caused by various fungi: *Cercospora coffeicola* Berk. and Cooke (the most frequent species), *Sphaerella Coffeae* Noack, *Colletotrichum coffeanum* Noack, *Stilbum flavidum* Cooke, and *Phyllosticta coffeicola* Spag.; these two latter are confined to some moist localities of the coast belt and are unknown in the great plantations of the interior. None of these fungi are really dangerous and their effects can not be compared to those caused by unfavourable climatic conditions and especially by the cold winds from the south, which sometimes lead to the drying up of the branches.

Some cases of rot are also to be mentioned; they are due to a fungus which has not yet been determined, and have been found in the State of Minas Geraes; but they are purely local cases.

**SUGAR CANE.** — This crop, also very important, does not suffer from dangerous diseases in Brazil, at least in the greatest number of plantations; only rare cases can be mentioned of the appearance of disease due to *Colletotrichum falcatum* Went. (morve rouge) and to *Thielaviopsis paradoxa* (de Seynes) v. Höhn (pineapple disease). *Leptosphaeria Sacchari* v. Breda de Haan and *Phyllosticta Sacchari* Speg. cause only insignificant injury to the leaves.

**TOBACCO.** — Tobacco leaves often bear spots due to *Cercospora Nicotianae* Ell. and Ev., and also other spots the causes of which are not yet well known: they do not seem to be due to parasites and are often designated by the vague name of "rusts".

**MAIZE.** — Only maize rust (*Puccinia Maydis* Ber.) has to be mentioned, and it is of no great importance.

**MATÉ.** — A great number of fungi, especially on the leaves, but seemingly not dangerous, have been noticed by Spegazzini on Maté (*Ilex paraguariensis*), a plant of the greatest economic importance in the south-western States of Brazil. I have recently had occasion to study the leaves of this shrub, on which I have recognized the presence of the following species: *Phyllosticta Mate* Speg., *Cercospora Mate* Speg., *Colletotrichum Yerbæ* Speg. and *Pestalozzia paraguariensis* Maubl. (description not yet published).

**RICE.** — Only *Piricularia Oryzae* Cav. is to be named.

**COTTON.** — The leaves of cotton are frequently attacked by *Uredo Gossypii* Lagerh. and *Cercospora gossypina* Cooke. A more serious disease is "fruit rot"; it is imperfectly known and doubtless due to the action of bacteria introduced by the punctures of insects.

**VINE.** — In the south of Brazil, vines have suffered from the following diseases: *Cercospora viticola* (Ces.) Sacc., the most frequent species, and when widely spread producing a serious disease; anthracnose (*Gloeosporium ampelophagum* [Pass.] Sacc.), very frequent; powdery mildew (*Oidium Tuckeri* Berk.); mildew (*Plasmopara viticola* [Berk. et Curt.] Berl. et de Toni); *Coniothyrium Diplodiella* (Speg.) Sacc., form on leaves

hitherto very rarely observed; *Septoria ampelina* B. et C.; *Colletotrichum ampelinum* Cav.; *Pestalozzia uvicola* Speg.

WHEAT. — On wheat, in the south of Brazil, smut (*Ustilago Triticis* Jens.) has been reported, and especially the rust, which, according to the samples received, is due to *Puccinia glumarum* (Schm.) Eriks. et Henn.; in one case only was I able to ascertain the presence of *Puccinia graminis* Pers. occurring with the preceding species.

FRUIT TREES. — The following list includes the parasites observed up to the present:

Guava tree: *Puccinia Psidii* Wint. (on leaves and fruits); *Gloeosporium Psidii* Delacr.; *Pestalozzia Psidii* Pat.

Mangoes: *Gloeosporium Mangae* Noack. (on the fruit); *Gloeosporium Mangiferae* Henn. (on the leaves).

Baranas: *Gloeosporium Musarum* Cooke and Mass.

Citrus fruits, various: gummosis; *Colletotrichum gloeosporioides* Perz.; *Septobasidium albidum* Pat. (on the excreta of scales).

Jaboticabeira (*Myrciaria Jaboticaba*): *Uredo Rochaei* Puttem, and *Oidium Rochaei* Putt.

Fig: *Uredo Fici* Cast. and *Phyllosticta sycophila* Thüm.

Papaw: *Sphaerella Caricae* Maubl. (very frequent in its coridial form *Asperisporium Caricae* [Speg.] Maubl.).

Cambuca (*Eugenia edulis*): *Uredo Cambucae* Henn.

Peach: *Monilia fructigena* Pers. and *Cladosporium carpophilum* Thüm.

Apple: *Gloeosporium fructigenum* Berk. and *Macrophoma malorum* (Berk.) Berl. et Vogl. (on fruit).

Pear: *Gloeosporium fructigenum* Berk.

Quince: *Gloeosporium fructigenum* Berk.

Plum: *Puccinia Pruni-spinosae* Pers.

Japanese plum (*Prunus trifolia*): *Gloeosporium fructigenum* Berk. and *Monilia fructigena* Berk.

#### VEGETABLES.

Cauliflower: *Alternaria Brassicae* (Berk.) Sacc. This species, studied by M. Pattemans, has caused serious damage, attacking the leaves and the flowers in the State of Rio de Janeiro.

French Beans: *Colletotrichum Lindemuthianum* (Sacc. et Magr.) Br. et Cav.; *Uromyces appendiculatus* (Pers.) Link; *Oidium erysiphoides* Fr.; *Isariopsis griseola* Sacc.

Peas: *Oidium erysiphoides* Fr.

Tomatos: *Septoria Lycopersici* Speg. (very frequent species).

Carrots: *Macrosporium Carotae* Ell. et Langl.

Asparagus: *Cercospora Asparagi* Sacc.

Celery: *Cercospora Apii* Fres.

#### ORNAMENTAL PLANTS.

Roses: *Phragmidium tuberculatum* Muell.; *Sphaerotheca pannosa* (Wallr.) Lév. (coridial form); *Marssonina Rosae* Br. et Cav.; *Cercospora rosicola* Pass.

Carnations: *Heterosporium echinulatum* (Berk.) Cooke.

Dahlias : *Oidium* sp.

Begonia Rex : *Oidium Begoniae* Puttem.

OAK. — *Oidium alphitoides* Griff. et Maubl. The appearance in Brazil of this dangerous parasite is interesting ; it dates from the month of August 1912, when oak mildew was observed by M. Puttemans in the gardens and parks of São Paulo ; semewhat later I recognized its existence at Campinas and since then the disease has made much progress.

Lastly fumagine is very widely spread on the leaves of a great number of plants (Aurantiaceae, coffee plants, etc.), where it is the consequence of the attacks of scale insects and aphides.

The preceding list does not claim to give a complete picture of the fungus diseases existing in Brazil ; it has been drawn up with the assistance of the documents possessed by the Phytopathological Laboratory of the National Museum, leaving out those species which do not present any practical interest, either because they attack wild plants, or because they do not cause any serious injury to cultivated plants. On the other hand a number of specimens preserved in the collections of the Laboratory have not been completely studied owing to want of time ; this study is being pursued at present and it may already be stated that a great number of parasites — the description of many of them has not yet been published — might be added to the above list.

Further, for instance at São Paulo, several fungi have been reported, some of them injurious to cultivated plants (*Phytophthora infestans*, *Plasmopara cubensis*, etc.), which do not appear in the above list. It would have been easy to lengthen it with the help of bibliographical data, but I wished to mention only those diseases which had been observed at the Phytopathological Laboratory of the Museum, and the specimens of which are preserved in its collections, thus allowing the determinations to be controlled.

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SECOND PART.  
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

624 - Project Relating to an Official Register of Selected Plants in Hungary. —  
*Korlatok*, Year 23, No. 32, pp. 1153-1155. Budapest, April 26, 1913

M. Emile Grabner, director of the Royal Hungarian Institute for the selection of Plants at Magyaróvár laid stress, in the report which he presented to the committee of the above Institute, upon the urgent necessity for a regulation dealing with the systematic development of the selection of agricultural plants. Although in Hungary plant selection has been practised for a number of years, it is only during the last seven years that it has met with any success. As the first step to promoting systematic plant selection is the encouragement of the agriculturists engaged in the task, M. Grabner suggests for this purpose the establishment of an official register of the plants selected in Hungary; the chief heads of the project are as follows:

1) The objects of the register are on the one hand to protect the rights of Hungarian agriculturists engaged in selection and to prohibit the illegal sale of varieties which have been improved by them, and on the other to afford every guarantee to the purchaser of the strict selection of the variety which has produced the seeds he wishes to buy. This guarantee does not extend to the quality of the seeds (*e. g.* to their power of germination), nor to the value of the crop, but exclusively to the identity and purity of the variety.

2) The register will comprise field crops (cereals, root crops, oil crops, industrial crops and forage crops) systematically selected in Hungary. In the case of autogamous plants, only those can be inscribed which have been obtained from pedigree selection, or by the hybridization of pedigree varieties; in that of allogamous plants, only those are admissible which have been obtained in the same way, or by selecting families; but if this method is employed, it is necessary to prove that the parent plants were selected according to the revision and annual classification of the register. It is necessary, in the case of new varieties obtained from others already

on the register, to prove by authentic trials that they are improved in some essential point; otherwise such varieties cannot be admitted.

3). The official register of selected plants is kept at the Royal Hungarian Institute of Plant Selection at Magyaróvár. The following details must be entered: *a*) a minute description of all the green and ripe parts of the variety registered; *b*) its date of ripening; *c*) the relative yield of the variety and of its parent plant; *d*) the system by which the improved variety has been obtained. This document must be accompanied by 50 mature plants of the variety to be registered, or by 22 lbs. of roots.

4). When all these conditions have been observed, the Institute undertakes the further revision, and sends an official to the spot before the date of the harvest; it is his duty to examine the condition of the seed, the selection plots and the method of selection. This official draws up a report of his observations, which he submits to the Institute; the grower must furnish all the necessary data; but should he wish to keep his method secret for further experiment, the official is required to treat the matter as a professional secret. A registration fee of 100 crowns (4 guineas) is paid to the funds of the Institute for each variety and should the grower wish to register several selected varieties, the fee for each additional one is 25 crowns (1 guinea). If it is found, on inspecting the variety on the spot, that it cannot be registered, the amount of the registration fee cannot be refunded, but instead, the agriculturist has a right to another inspection within the year. The money obtained by the registration tax is deposited in the State banks. The Institute makes annual test sowings of the registered varieties on an area of 60 sq. yds. in the case of autogamous plants, and 240 sq. yds. for allogamous ones. The owners are required to provide the seed free. The essential characters obtained by these experiments must be compared every year with those exhibited by samples grown the preceding year and preserved in the Institute collection; if any difference is observed, or if the characters are not identical with those entered in the register, the owner in question must be informed, and it must be ascertained whether the variety he has put on the market is identical with that on the register; should the contrary be the case, the variety must be struck off the register. The continued selection of a variety entered on the register is controlled by the Institute, an official being sent once a year to the estate where the selection is being carried out to examine the plant and the method employed.

The Committee unanimously approved M. Grabner's project and will submit it for the approval of the Ministry of Agriculture.

625 - **Agriculture in Rumania.** — CARDAS, AGRICOLA in *La Vie agricole et rurale*, Year 2, No. 21, pp. 604-607. Paris, April 26, 1913.

The total area of Rumania is 32 445 600 acres; of these 5 699 215 are occupied by forests, while 18 045 428 are devoted to agricultural purposes and are divided between the various crops as follows:

DEVELOPMENT  
OF AGRICUL-  
TURE IN  
DIFFERENT  
COUNTRIES

Cereals . . . . .		12 801 157 acres
Wheat . . . . .	5 111 695	acres
Rye . . . . .	264 904	»
Barley . . . . .	1 234 771	»
Oats . . . . .	943 051	»
Maize . . . . .	5 135 902	»
Millet . . . . .	109 364	»
Buckwheat . . . . .	1 470	»
Textile and oil-producing plants . . . . .		267 073 »
Leguminosae and potatoes . . . . .		178 967 »
Industrial plants . . . . .		60 841 »
Market gardens . . . . .		58 220 »
Meadows (natural and laid down) . . . . .		1 366 885 »
Vineyards . . . . .		215 772 »
Plum orchards . . . . .		183 292 »
Pastures . . . . .		2 913 221 »

Arable land has so far steadily increased at the expense of the pastures. Nearly 85 per cent. of the whole arable land is under cereals (wheat 33.78 per cent. and maize 33.94 per cent.).

Large estates occupy 9 411 986 acres, which are divided between only 5385 properties, some of these consisting of more than 12 000 acres. There are 38 723 medium sized holdings of 25 to 250 acres; these occupy an area of 2 131 200 acres. Small holdings account for 7 789 872 acres, divided between 920 939 owners.

The average wheat crop is 16.6 bushels (of 60 lbs.) per acre, while maize produces 14.5 bushels (of 56 lbs.) per acre.

The total value of the agricultural products of Rumania for 1911 is reckoned at £55 450 000, of which the cereals alone brought in £46 038 000.

The native vines have been almost entirely destroyed by phylloxera, but the vineyards have been replanted with foreign varieties, imported especially from Algeria.

According to the census of 1908, Rumania possesses domestic animals worth £22 186 500. The horses belong to eastern breeds: in 1908 there were 807 704, representing a value of £4 323 900.

The cattle chiefly present the characters of the steppe breeds. There is a mountain and a plain variety, each of which furnishes excellent draught animals, but they are poor for beef and milk. The 1908 census gave 2 585 205 head, estimated at £13 014 000.

Sheep are principally represented by the native Tzarcana breed, with long rather wavy wool, and the improved Tzigea breed, related to the Merino. According to the census of 1908 there were 5 104 506 head, worth £2 152 200.

Pigs also comprise a primitive native breed and an improved breed, the Mangalicza. Pig breeding is an important industry; in 1908 there were 1 123 564 of these animals and their value was estimated at £2 371 670.

Farming methods are rather primitive in many districts; regular rotations are only followed on large estates, while the use of chemical fertilizers is very restricted. Cattle breeding also leaves much to be desired, though there is a pronounced activity in this direction.

Agricultural instruction is the subject of special attention on the part of the Government; it is imparted in 20 farms schools, 19 practical schools, some intermediate schools and one special school at Bucharest. The higher branches of agriculture are now taught at the Universities.

The Agricultural Credit Institutions are very prosperous. The Rural Land Credit possessed in 1909 credit letters to the amount of £15 293 300. There is, in addition, an Agricultural Bank, an Agricultural Credit, a Vine-growers' Credit, a Rural Bank and some Popular Banks.

626 - **Agriculture in Bulgaria.** — GANTCHEFF, G. in *La Vie agricole et rurale*, Year 2, No. 21, pp. 596-603. Paris, April 26, 1912.

The value of the agricultural products exported by Bulgaria in 1911 represented 88 per cent. of that of the total exports, whilst the imported agricultural products formed only 4.4 per cent. of the total. The country had a total area of 23 798 300 acres, of which 7 988 300 were arable land, 877 150 natural meadow, 22 725 fruit and mulberry plantations, 19 500 rose gardens, 234 650 vineyards and 2 255 700 acres pastures, while forests occupied 6 995 100 acres.

The area of the arable land is constantly increasing at the expense of the pastures and sometimes of the forests and meadows. Of this total area of 18 393 200 acres in 1908, 11 426 700 acres were private properties divided as follows :

Holdings of	less than $2\frac{1}{2}$ acres . . .	about 100 000
" "	$2\frac{1}{2}$ to $12\frac{1}{2}$ "	241 399
" "	$12\frac{1}{2}$ to 25 "	162 271
" "	25 to 50 "	94 331
" "	50 to 70 "	17 305
" "	70 to 250 "	9 175
" "	250 to 1 250 "	845
" "	over 1 250 "	91

Large properties are not only rare, but the area which they occupy is only 2 per cent. of arable land. Division into small holdings is carried to an extreme length and constitutes a serious hindrance to the proper cultivation of the land.

In 1908 there were 5 714 651 acres under cereals, 38 230 under industrial plants, 179 703 under pulse, etc., 67 505 under melons and water-melons, 22 710 under vegetables, and 234 727 under forage crops, while 1 577 000 acres were out of cultivation ("resting") and 153 900 acres were under worked bare fallow. Thus cereal cultivation occupied about 71.5 per cent. of the total cultivated area; this extraordinarily large proportion is explained by the fact that in Bulgaria maize is grown as a fallow crop and is considered a good preparation for wheat. Nevertheless, the farmers are gradually learning that this system would eventually lead to the complete exhaustion of the soil, and forage crops, especially vetches and lucerne, are steadily gaining ground. Amongst cereals, wheat occupies the first place: in 1911 there were 2 688 500 acres under wheat; then follow maize with

1 560 950 acres, barley with 620 440 acres, rye with 545 200 acres, and oats with 446 590 acres. Millet, spelt, rice and buckwheat are little cultivated and only in a few districts.

In 1911, tobacco occupied 29 945 acres and produced an average of 630 lbs. of dried leaves per acre. Only a small amount of the crop is exported, and that to Germany and Austria-Hungary; in 1910, the value of this export amounted to £81 000.

During the last five years, the area under rose gardens has been about 18 500 acres. In 1911 Bulgaria exported 9 772 lbs. of attar of roses, worth £237 954.

The same year, there were only 7330 acres under sugar beets, for there is at present only one sugar refinery; but two others are in course of erection, so that the cultivation of sugar beets will develop in the near future.

The use of improved agricultural machines and implements has increased much and with considerable rapidity during the last few years. The following shows the numbers in 1893 and 1905:

	1893	1905
Ploughs . . . . .	18 710	69 577
Drills . . . . .	35	297
Reapers . . . . .	128	1 286
Thrashing machines . . . . .	17	250

Cattle breeding is as yet little developed in Bulgaria, not only from the point of view of the number, but also of the quality of the animals. The efforts made by the State for the improvement of domestic animals have not met with much success; in the opinion of the writer this is chiefly due to the want of markets and outlets for trade. The country, in truth, possesses all the natural conditions for intensive stock breeding, as is proved by the brilliant success obtained with some breeds in the State farms. The most important and best-adapted breeds of cattle are the Montafon and the Oberinntal; in two agricultural schools Simmenthal cattle are raised, while the Angle breed is kept at the Sadovo Agricultural School. Thanks to the high prices of butter and cheese, milk is more profitable than it was formerly. Cow and buffalo milk is either used in its natural condition, or as "kicélo-mléko" (yoghurt); very little butter is exported. Ewes' milk is chiefly used for making white cheese and "cacio-cavallo". In 1911, Bulgaria exported 2 393 100 lbs. of the former, worth £35 482 and 5 140 190 lbs. of "cacio-cavallo", worth £123 781.

For the purpose of improving horse breeding, the State has established three stud stations and two stallion dépôts, with a total of 400 stallions, which travel throughout the country during the service period. Shows and premiums are also fairly frequent. For some years, the State has been buying good stud animals (bulls, cows, stallions and mares), which it lends to private individuals on condition that they keep the animals for three years under State control, and use them for breeding purposes. (In the case of cows, the State is entitled to one calf of a year old after three

years). This system has so far not given good results, owing to lack of proper control.

On account of the ready sale of eggs, the stock of poultry has greatly increased of late years; while the eggs exported in 1891 were estimated at only £12 000, the figure for 1911 reached £541 000.

In 1887 there were 201 800 acres of vineyards in Bulgaria; but owing to the ravages of phylloxera the area was reduced to 147 480 acres of native vines and 20 170 acres of American varieties. In the last three or four years replanting with American vines has been carried out on a large scale.

The economic and natural conditions of Bulgaria are in general not favourable for fruit growing, though an exception must be made in the case of some little valleys where the climate is very suitable; one of these is Kustendil, where fruit trees supply one of the principal sources of revenue. There are some 21 230 acres of orchards in Bulgaria, but the value of the exported fruit is estimated at below £14 000.

Bee-keeping has lately made great progress. There were 220 934 hives in Bulgaria in 1908, which produced over 2 million pounds of honey; this was all consumed in the country.

At one time, the idea was entertained of planting mulberry trees in the place of the vineyards which had been destroyed by phylloxera and the State made every effort to encourage silkworm rearing. In 1891 the value of exported cocoons was only £16 890, while during the period 1906-1910 it rose to an average of £132 000 a year. But during the last two years (1911 and 1912) the great fall in the price of cocoons has destroyed the confidence of the silkworm breeders and the latter have already begun to cut down the mulberry trees.

1927 - **Agriculture in French Guinea.** — SOLICHON. Les produits utiles de la Guinée française. — *Ministère des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 63, pp. 65-76. Melun, March 1913.

Hitherto only traders have availed themselves of the vegetable wealth of French Guinea, and that to a limited extent, except in the case of rubber, which forms the principal staple of export. Until now the natives have only grown those crops which they required for their own consumption; they have tapped rubber trees and lianas, the produce of which is sufficient to cover the personal taxes levied on the inhabitants.

*Soil.* — Though but insufficiently tilled with hoes ("daba"), the soil is of extraordinary fertility. The country is mostly hilly, but it possesses also plains ("bowals") which provide pasture to numerous herds, and forests of tree-ferns and low trees, except in Lower Guinea where the lateritic, sandy loamy or clayey soil lends itself to rapidly growing crops.

*Climate.* — There is not much difference as regards rainfall and high temperature between Upper and Lower Guinea, with the exception of the mountain group of Fouta-Djalon where the temperature is mild and often cold. The climate of the highlands, that is of Middle and Upper Guinea, is easily supported by colonists.

*Labour.* — At present, owing to the emancipation of serfs, labour is more abundant; further, the railways have partly suppressed the use of

porters, which system formerly absorbed most of the native labour. In general both porters and farm hands are paid from 7 *d* to 9 ½ *d* per day, besides about 1 ½ lb. of rice worth about 1 ½ *d* to 1 ¾ *d* per lb.

*Agriculture.* — The land may not be sold by those who occupy it because it belongs to the community of natives represented by the village or by a group of villages.

The intensive cultivation of rice, earthnuts, fonio, maize, cotton, to mention only the most important crops, would give excellent results in farms organized on modern lines and provided with steam ploughs and other agricultural machines and implements.

The chief native crops are :

*Rice.* — Cultivated throughout the whole of Guinea in the flooded plains and in the neighbourhood of swamps and watercourses. It is the staple food of the natives, who, it is estimated, consume about 709 000 tons per year, while the production of the country is valued at only 295 000 tons. The average price is about 10s per cwt., and the yield about £6 8s per acre.

*Earthnuts.* — Are grown only for home consumption, but they might be produced for exportation.

*Fonio.* — Is one of the crops most esteemed by the natives, who cultivate it intensively. This cereal gives, on being crushed, a very nutritious meal, which might be advantageously exported as a substitute for fecula and semolina.

*Maize* and *Manioc* are not exported.

*Yams* are not much grown.

*Kola nut tree.* — Grows well in Upper Guinea near swamps and flooded lands. It begins to bear fruit when about 10 years old and yields from 500 to 800 nuts. The current local price is about 1 ½ *d* per nut; in Europe the nuts are sold at 2 s 10 ½ *d* per lb. It might be one of the principal exports of Upper Guinea; nevertheless no Europeans have taken it up.

*Bananas.* — They are grown on a large scale by the « Camayenne » Colonisation Company and they are also exported. They thrive well only in Lower Guinea, though some specimens are found also in the high belt. Bananas begin to bear at the age of 18 months at latest. A banana plantation yields sometimes forty times as much as an intensively cultivated potato field. Along the Konakry-Niger railway and near the ports it is one of the most remunerative crops.

*Coconuts* thrive well along the sea coast, reaching inland about 30 miles into the forest region. They begin to bear at eight years of age and they yield an average of 33 lbs. of copra per tree per annum, worth 15s 9*d* to 18 s per cwt. (112 lbs). The principal trading firms are those of Hamburg, Liverpool and especially Marseilles, which buys yearly about £ 3 200 000 worth of copra from Manila, Ceylon, Singapore and Mozambique. The colonies of the Ivory Coast and of French Congo, richly endowed with dense forests, would lend themselves to the exploitation of this plant better than French Guinea, where however it would be easy to grow it along the coast, instead of which it seems quite abandoned in French West Africa.

*Elaeis guineensis* is abundant in French Guinea, but it is not so plentiful as in the Ivory Coast and Dahomey. Replanting this tree along the railways and near Konakry could give excellent results.

Rubber is yielded by *Funtumia elastica*, *Manihot Glaziovii*, *Hevea brasiliensis*, *Landolphia owariensis* and *L. Guineensis*. The law obliges the natives to replant the lianas. Heveas and the lianas (*Landolphia*) give the best rubber, which sells at 4s to 4s 8d per lb., while *Manihot Glaziovii* yields a fragile rubber and in smaller quantity. A new preparation is announced from Guinea: rubber in small slabs, which yields 98 per cent. of its weight industrial rubber.

Cotton is indigenous in French Guinea; it is grown, spun and woven by the natives of Middle and Upper Guinea. A French company has attempted to extend and to improve cotton growing among the natives of Lower Guinea, but the results were not very successful because the varieties introduced from Egypt and America were attacked by the boll-worm (*Heliothis obsoleta*) and other parasites. It appears, however, that better results would be obtained in Middle and Upper Guinea by selecting the native varieties.

*Live stock.* — The live stock is estimated to consist of about 2 000 000 head of cattle, 1 000 000 of sheep and 10 000 horses and asses.

The cattle of Upper Senegal-Niger are better and larger than those of Fouta, which however yield a better flavoured beef; the writer believes that crossing the two breeds would improve them. There is no farm school in which animal husbandry is taught; private initiative is completely wanting.

The writer believes that European experts could realize handsome profits in the live stock trade in Middle and Upper Guinea, provided that some farm schools be founded.

628 — **The Agriculture of Mozambique Province, Portuguese East Africa.** — LYNE, R. N. in *Bulletin of the Imperial Institute*, Vol. XI, No. 1 pp. 102-110. London, January-March 1913.

The southern part of the Province of Mozambique, including Gazaland, may be classed as sub-tropical, and is suitable for cattle grazing and the cultivation of maize. The native pastures do not fail during the dry season as is the case with the high veldt, and the heavy breeds of cattle such as the Shorthorn and Friesland thrive and cross well with the native cattle; moreover the whole district south of the Limpopo river has been cleared of the East Coast fever. While it is estimated that one million head of cattle could be maintained on this area, it carries at present only about 5 per cent. of that number; but the district is undoubtedly destined to become an important producing centre in the cattle and dead meat industry of the world.

The greatest agricultural asset of the country is represented by the *Landolphia* rubber forests, and the question of their most profitable exploitation has been the subject of much discussion. It does not seem possible to manage them as plantations and probably the only practical and profitable method of obtaining the rubber is to cut down the vines, extract the

rubber by machinery, and utilize the land for new crops. Ceara rubber has been established in the Quilimane district, where plantations are thriving, but south of the Zambesi the climate is not sufficiently moist for its cultivation.

Mozambique possesses excellent river systems and in the river valleys ideal conditions for sugar cane planting are met with. This fact is being realized, and the output of sugar, which was 30 000 tons in 1910, will have doubled itself by 1914. Oil-producing plants are of less importance than would be expected from the geographical position of the country: coconuts only flourish in a few coastal districts, and the seeds of *Trichilia emetica* (the source of the "mafura" tallow), which occur abundantly at Inhambane, command such a poor price on the market that it does not pay to collect them for export. Groundnuts too, though of excellent quality, will not repay the employer of labour to cultivate them.

Sisal hemp grows in all parts of the Province, and the abundance of running water which is essential for the extracting factories, as well as the rather dry soil and climate in many parts, make the prospects of profitable cultivation very favourable. Cotton has been tried and proved a complete failure, but the question requires further investigation before the crop is finally condemned. The outlook for tobacco on the other hand is most promising though the industry is still quite in its infancy.

On the whole, Mozambique may be said to be the country of the syndicate and of the steam plough; in only two places has close settlement been attempted. Out of the whole Province, and in fact out of the whole of East Africa, the district of Quilimane may be picked out for its remarkable fertility. It is traversed by 8 or 10 considerable rivers flowing with abundance throughout the year, and the soil, though varying in quality, is never poor. The land rises gradually from the coast, the rainfall is about 60 in. per annum and well distributed, and the climate is not unhealthy as African climates go.

629 - Agriculture in German South-West Africa. — GAD, JOHANNES in *Deutsche Landwirtschaftliche Presse*, Year XL, No. 26, pp. 316-317. Berlin, March 29, 1913.

The natural conditions prevailing in German South-West Africa compel the settlers to devote themselves to live stock breeding on extensive lines, all other branches of agricultural production falling into the background. According to the official farm list, out of the whole extent of farmed land, about 26 770 000 acres, only 12022 acres or 0.045 per cent, were arable land. In the two districts most suitable for agriculture, Windhuk and Grootfontein, this percentage rises to 0.1 and 0.155 respectively.

The writer gives several reasons for the failure of the attempts hitherto made to extend agriculture: only a small proportion of the present settlers were farmers in their homes; the land really suitable for agriculture is limited in extent; the difficulties with which agriculture in the Colony has to contend have often been much undervalued. The small amount of rainfall, the brevity of the rainy season, the unequal distribution of the rains, the sudden frosts, the very numerous pests, form difficulties

which can only be overcome by very intensive cultivation. Where small areas are cultivated with intensive methods, crops of 900 to 1800 lbs. of maize per acre are obtained; where, however, greater areas are but roughly tilled, frequently only 45 to 90 lbs. are harvested.

With intensive cultivation the expenses reach £ 2 to £ 4 per acre, so that a crop of 900 to 1800 lbs. at about 11s per cwt. would yield a profit of £ 2 to £ 6 per acre. Even reckoning on one really good harvest, two average ones and one complete failure every four years, such intensive farming on a small scale is fairly remunerative. Wheat, oats and millet also promise good and sure harvests.

A further extension of this intensive cultivation is limited by the question of its profitableness. When the local consumption is provided for, the excess must be sold at the general prices of the great markets of the world, that is maize must be delivered at the port at 5s 6d per cwt. Now this seems impossible on account of the intensive tillage required, of the serious want of native labour and of the high railway tariffs. If the maize-producing northern district of the colony is to be able to compete in the south with the imports from Cape Colony and meet the wants of the country itself, it must have at its disposal sufficient cheap native labour and a lower railway tariff. The first step, however, is the prosperous development of the stock raising industry, which will give the necessary means for the establishment, in the course of time, of healthy farming in German South-West Africa.

630 - **The Island of Formosa.** DAUTREMER, JOSEPH in *Bulletin de la Société de Géographie Commerciale de Paris*, Vol. XXXV, No. 3, pp. 164-171. Paris, March 1913.

General information about the economic importance of this island, and the monopolies of opium, salt, camphor and tobacco. Also regarding the progress of the irrigation works and the rice production; the amount of rice at present exported to Japan is worth over 18 million frs. (£700 000). The cultivation of sugar cane is extending, and the value of the sugar now exported to Japan is 90 million frs. (£3 500 000). Tea, however, makes the largest export: green tea, «oulong», «souchong» and black tea are exported to the value of 17 or 18 million frs. The chief agricultural products, in addition to those already mentioned, are sweet potatoes, ramie, jute and indigo.

631 - **Agriculture in the "Altos" of Guatemala.** — SAPPER, KARL in *Der Tropenpflanzer*, Year 17, No. 4, pp. 191-199. Berlin, April 1913.

Notes upon the conditions of agricultural exploitation in western Guatemala: Climatic conditions, cultural methods and the chief crops grown (maize, wheat, lucerne, potatoes) are dealt with.

632 - **Courses of Instruction and Lectures on Fruit, Vegetable and Flower Culture in Belgium.** — *Ministère de l'Agriculture et des Travaux publics, Bulletin de l'Agriculture et de l'Horticulture*, Year 2, No. 6-7, pp. 361-421. Brussels, 1913.

Last winter, in accordance with a Ministerial Decree of September 5, 1912, courses of instruction consisting of 20 lectures on fruit-growing were held in 22 places in Belgium and similar lectures on

EDUCATION  
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MENTATION IN  
AGRICULTURE  
AND FORESTRY

market gardening in 10 places. Series of lectures (generally 5 or 6 in number) were also given; of these the subject in 244 places was fruit-growing, in 242 market gardening, and in 61 flower-growing.

The Ministerial Decree contained a detailed curriculum both for the instruction courses, and for the series of lectures.

- 633 - **The Agricultural Curriculum at the Hamburg Colonial Institute.** — *Hamburgisches Kolonial-Institut und Allgemeines Vorlesungswesen, Verzeichniss der Vorlesungen im Sommerhalbjahr 1913*, pp. 6. Hamburg, 1913.

The course on colonial agriculture at the Hamburg Colonial Institute includes: agriculture, veterinary science, natural science, and rural economy; also optional attendance at all the other lectures and at the foreign language classes. The course lasts four terms, and at the conclusion the students may take an examination for a diploma for proficiency in Colonial agricultural knowledge.

- 634 - **The Establishment of a German School of Pisciculture at Eger.** — SCHUBERT, OTTO KAR in *Oesterreichische Fischerei-Zeitung*, Year X, No. 7, pp. 114-115. Vienna, April 1, 1913.

The Provincial Agricultural Council of Bohemia proposes establishing a German School of Pisciculture for the theoretical and practical instruction of pisciculturists and of the staff employed in fish-breeding establishments. The school in question will be at Eger, a town which offers every facility for the sale and despatching of fish, as well as for the practical work of fish-breeding.

- 635 - **The Royal Practical School of Agriculture at Todt (Perugia, Italy).** — *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year 12, Vol. 1, Series A, Part 9, pp. 231-253. Rome, March 1, 1913.

The organization (administration, teaching staff, regulations) and curriculum of the course, which extends over a period of four years.

- 636 - **Amalgamation of the Poultry Stations in South Australia.** — LAURIE, D. F. The Poultry Stations. Scheme of Amalgamation. — *The Journal of the Department of Agriculture of South Australia*, Vol. XVI, No. 7, pp. 784-786. Adelaide, February 1913.

The scheme for amalgamating the three existing Poultry Stations of Roseworthy, Kybybolite and Murray Bridge has been approved by the Minister of Agriculture and will be given early attention. There will now be one central State Poultry Station at Parafield, about 10 miles from Adelaide. Its objects will be to carry on the laying competitions and various food experiments. All experiments will be on a large scale, and breeding, incubation and other experiments will be carried out. Table-bird breeding will form a special branch, and only proved breeds will be kept. A good revenue to pay for the work will be obtained by keeping some thousands of hens and pullets to supply market eggs.

A large building will be converted, so as to provide two large incubation rooms. Two large brooder houses will be erected and yards laid out to provide accommodation for rearing chickens, breeding stock, experimental work, egg production, etc.

The new Poultry Station will afford excellent opportunities for teaching pupils the newest methods in poultry rearing and keeping.

- 637 - Ruakura Farm of Instruction. A Digest of the Work of the Year. — McCONNELL, PRIMROSE in *New Zealand Department of Agriculture, Industries and Commerce, The Journal of Agriculture*, Vol. 6, No. 1, pp 24-33 Wellington, January 15, 1913.

Numerous experiments were made, or continued, the subjects dealt with being as follows: 1) plant selection (cereals, turnips and mangels) and plant diseases; 2) forage plants for dairy-cows; 3) manuring (pastures, green-manuring); 4) fat lamb breeding, calf-rearing (raw crushed linseed seems equal to boiled or scalded as cream-substitute), treatment of stomach-worms in sheep. A lucerne paddock has been successfully established on swamp land. Numerous sittings of eggs of carefully selected poultry have been distributed. The Farm has also sent authentic exhibits and information to the various shows throughout the Dominion.

- 638 - Regulation for the New Higher School of Agriculture and Veterinary Medicine in Brazil. — *Diario Oficial, Estados Unidos do Brasil*, Year LII, No 24, pp. 1473-1486. Rio de Janeiro, January 29, 1913

The Decree No. 9857, dated November 6, 1912, approves the regulation (which is annexed to the decree) of the "Escuela Superior de Agricultura e Medicina Veterinaria" about to be instituted. Education in agriculture and in veterinary science will form two distinct courses for agricultural engineers and for veterinary surgeons. The special course for the former will last three years; for the latter four years. Each of them will be preceded by a preparatory course of one year.

An experimental field (Fazenda experimental) will be attached to the school. It will be devoted to the practical teaching of agriculture, animal husbandry and the chief rural industries, as well as to experimentation in the extensive and intensive methods of growing the industrial and forest plants of the country.

- 639 - The Great Agricultural Week in Paris. — HITIER, H. in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, No. 3, pp. 462-472. Paris, March 1913

The Great French Agricultural Week was held in Paris from the 17th to the 24th of February. In this time the following Agricultural Associations held their general assemblies: Société des Agriculteurs de France, Association des Ingénieurs-agronomes, Société des Viticulteurs de France, Société de l'Industrie laitière, Syndicat des Fabricants de Sucre, Union Centrale des Syndicats des Agriculteurs de France, Syndicat Central des Agriculteurs de France.

A general Agricultural Exhibition was held at the same time; the different sections of the latter were as follows: fat stock, dairy produce, agricultural and horticultural produce, packing materials, and agricultural machinery.

The "Société des Agriculteurs de France" which has over 10 000 members and is divided into 14 sections, held sectional meetings every morning during the week and general meetings in the afternoons; the discussions were on technical, economic, and social questions connected with agriculture, such as mechanical ploughing, the employment of electricity

in agriculture, the labour question, the housing of labourers, legislative regulation of labourers' pensions, home work. Amongst other decisions, the meeting resolved to devote 20 000 frs. (nearly £800) to making exhaustive trials with mechanical ploughs at Puiseux (Seine-et-Oise).

The "Société d'Encouragement à l'Agriculture" held a three-days' Congress for the purpose of discussing questions connected with the exportation of agricultural produce, the sale and exportation of cereals, cattle, pigs and pork, wine, fruit and fruit wines, olive oil, vegetables and flowers.

The chief result of the fat stock show was the proof afforded of the flesh-producing qualities of the Charolais cattle and the Craonnais pigs.

After briefly mentioning the exhibition of the products of agricultural industries, and the exhibition of the agricultural and horticultural products of Algeria, Tunisia, Morocco, the Mediterranean coast and the Rhone Valley organised by the P. L. M. railway, the writer gives some interesting information concerning the development in the trade in early vegetables and flowers from the South of France and Algeria, and the measures adopted by the above Company for the rapid despatch at low rates of this produce to the Parisian and foreign markets.

Over 160 makers of agricultural machines sent exhibits to the show; of these the motor ploughs and milking machines aroused the most interest.

#### 640 - Agricultural Shows.

##### *Austria:*

1913. Sept. 7-9. Kirchdorf a. d. Krems (Lower Austria). — Agricultural and Industrial Exhibition organized by the "Landwirtschaftlicher Bezirksverein in Kirchdorf."

##### *Belgium.*

1913. Sept. 7-9. Louvain. — Ornithological Exhibition. Sec.: M. Eug. Taut, 153, Rue de la Station, Louvain.

Nov. 15-17. Renaix. — International Show of the Renaix Pigeon Club. For information, address: M. O. Rose, Renaix.

Dec. 13-16. Liège. — Third International Show of Birds of all species, organized by the Liège Avicultural Society ("Société ornithologique"). For information, address to the Sec.: M. Ch. de Neef, 46, rue des Mineurs, Herstal.

##### *Denmark.*

1913. Summer (opens June) Copenhagen. — General Cold-storage Exhibition, organized by the "Association des Industries." Address: Bureau of the "Association des Industries," Copenhagen.

##### *France.*

1913. July 16-19. Saumur. — Central Show organized by the "Société d'encouragement à l'élevage du cheval de guerre français" (Society for encouraging the breeding of French army horses).

Sept. 23-24. Saint-Quentin (Saint Lazare farm), Aisne. — Competition in mechanical beet-pulling, organized by the "Comice agricole" of the arrondissement of St. Quentin. Address, before Aug. 15, to the general sec.: M. Cardon, rue de Gouvernement, 36, Saint-Quentin.

October. Saint-Etienne. — Show of industrial inventions and novelties. Address to offices of the "Union des Inventeurs de la Loire," Hôtel de Ville, Saint-Etienne.

Oct. 24-Nov. 2. Paris, Cours-la-Reine. — General autumn horticultural show, organized by the "Société Nationale d'Horticulture de France".

Nov. 6-10. Bordeaux. — General autumn show, organized by the "Société d'Horticulture de la Gironde." Address, before Oct. 20, to the general sec.: M. Morain, 10 rue Sainte-Catherine, Bordeaux.

Nov. 19-23. Moulins. — Poultry Show, organized by the "Société des Aviculteurs et Agriculteurs du Bourbonnais et du Centre." Address to the president: M. Buval, 8, avenue Victor-Hugo, Moulins, Allier.

1914 May 1-Nov. 1. Lyons. — International Urban Exhibition Sections will be reserved for foods of animal origin in general, and for milk and its derivatives.

#### *Germany.*

1913. July 11-13. Corbach. — Agricultural Show for Waldeck and Pyrmont. Address to "Geschäftsstelle der Landwirtschaftskammer," Mengeringhausen.

#### *Holland.*

1913. June 25-July 10. Sittard. — International Exhibition of Industry, Commerce, Agriculture, Arts and Science.

Aug. 20-22. Kampen, Zandberg, Champ de Mars. — Agricultural Show, and annual meeting of the Agricultural Society of Guelders and Overijssel.

#### *Italy.*

1913. September. San Vito al Tagliamento (Udine Prov.). — Cooperative Dairy Show, organized by the "Circolo agrario" and the "Cattedra ambulante di agricoltura" of San Vito al Tagliamento.

1914. Milan. — Exhibition of Cold, Heat and Light, on the occasion of the 50th. anniversary of the founding of the Milan Polytechnic School.

1915. Melegnano (Milan Prov.). — Lombardy Agricultural Show.

#### *Japan.*

1913. October. Yokohama. — Japanese Agricultural and Industrial Exhibition, organized by the "Kwangyo Kyotal" (Industrial Association) of Yokohama. A section is devoted to products imported into Japan.

Autumn. Toyama and Kagoshima. — Provincial shows.

1914. Tokyo, Ueno Park. — Exhibition organized by the Prefecture of Tokyo (under Government patronage). Foreign products will be admitted.

#### *Norway.*

1914. Christiania. — Norwegian Jubilee Exhibition ("Norges Jubileums-Utstilling"). Will include a permanent and temporary agricultural shows.

#### *Panama.*

1914. Jan. 21-May 31. Panama City. — National Exhibition on the occasion of the fourth centenary of the discovery of the Southern Pacific by Adelantado Vasco Núñez de Balboa

#### *Peru.*

1913. Nov. 2-Dec. 31. Lima. — International Exhibition of Hygiene. A section is devoted to food materials and non-alcoholic drinks. Entries close Oct. 20. Address to: "Presidente de la Comisión Ejecutiva de la Exposición de Higiene", Academia de Medicina de Lima, Plaza de la Exposición, Lima, Peru.

#### *Portuguese East Africa.*

1913. October. Loanda. — Agricultural Show.

#### *Russia.*

1913. Sept. 5-8 (Aug. 23-26 old style). Mitau. — Agricultural Show organized by the "Kurländische Ökonomische Gesellschaft" of Mitau.

#### *Spain.*

1914. May (provisional date). Valencia. — Exhibition of agricultural machines, and especially machines for rice-growing and rice driers, on the occasion of the International Rice-Growers' Congress.

*Switzerland.*

1914. May 15-Oct 15. Bern. — Swiss National Exhibition.

*Tripoli.*

1918. Autumn. Tripoli. — First Italian Industrial Exhibition. Includes a section for agriculture, colonisation and local industries. Offices: Via Maddalena, 15, Milan.

*United Kingdom.*

1918. Islington (London), Agricultural Hall. — Second International Exhibition of Chemical Industry, Engineering and Metallurgy. Organiser: F. W. Bridges, 124 Holborn, London, E. C.

*Uruguay.*

1918. Autumn. Montevideo, Prado. — General Agricultural Show, organized by the "Asociación rural de Uruguay."

b41 — **Congresses.***Austria-Hungary.*

1918. June. Kaschau — Congress of Hungarian Farmers, organized by the Hungarian Farmers' Society.

*Belgium.*

1918. Aug. 1-5. Brussels. — Third International Congress for the Study of Cancer, organized by the Belgian Commission for the Study of Cancer. Address to: Dr. Heuseval, Palais du Cinquantenaire, Brussels.  
Sept. (early). Ghent. — Pomological Congress.

*United Kingdom.*

1914. Aug. 3-8. London. — Tenth International Veterinary Congress. Address of Organizing Committee for Great Britain and Ireland: Royal College of Veterinary Surgeons, 10 Red Lion Square, London, W. C.

## CROPS AND CULTIVATION.

AGRICULTURAL  
METEOROLOGY

642 — **Weather Forecasting and Sun Spots.** — POSKIN, P. *Météorologie et Météorologie Agricole* (Inaugural address for the Session 1912-1913 delivered at the State Agricultural Institute). — *Annales de Gembloux*, Year 23, Nos. 1 and 2, pp. 1-18 and 61-89. Brussels, February and March, 1913.

After a brief account of the present state of meteorological Science, and a short history of the development of the meteorological services in the different countries, the difficulties of accurate forecasts in Europe are dealt with, and shown to be due in part to the irregular course taken by the cyclonic disturbances, and in part to the lack of recording stations on the eastern side of the Atlantic Ocean. Long period forecasts, *i. e.* the average weather to be expected in the more or less distant future, are then discussed, the question being whether there exists any periodicity in meteorological phenomena, and if so what its fundamental cause may be.

While meteorologists are agreed on the fact that the primary cause of meteorological disturbances lies in the unequal distribution of heat over the earth's surface, opinions differ as to the latter's connection with solar phenomena. Sun spots have been observed since the time of Galileo and an examination of their records shows that their area — which is correlated with general solar activity — increases and decreases perio-

dically, the interval between two maximum or minimum points varying from 8 to 14 years, with an average of 11.2 years. Besides this, there is exhibited a further periodicity of 33.6 years, that is to say that in every third period the maximum point is higher than the maximum points in the two intervening periods.

Nordmann, working with data from the tropics where the climate is very regular, plotted the variations of the annual mean temperature above or below the mean for the whole period (1870-1902). He then compared the curve thus obtained with the inverse curve of the frequency of the sun spots for the same period, and showed that there was a remarkable agreement between the two curves. In temperate regions with an irregular climate, this correlation is far less apparent but still exists. The writer, using data from Uccle, Belgium, for the period 1833-1912, plotted the differences between the monthly mean temperature for each month and the average temperature of the month over the whole period. The resulting curve is very irregular; usually one or two months above the average are followed by one or two months below the average; but from time to time, at intervals of 11 years, several hot months follow one another, and these periods of higher temperature correspond to periods of least solar activity. Data from Paris confirm the results in a general way, as do yet other data from S. Francisco, Sacramento, and San Diego.

Professor Douglass, working with old pine trees in Arizona, measured the radial thickness of the annual rings, and plotted the results. He remarked that there were specially high and specially low points in this curve every 32.8 years, with less marked points every 11 years (1).

The periodicity of seasons of high rainfall has been shown for Ceylon by Lockyer: for Mauritius, Port Louis, Brisbane, and Adelaide by Meldrum; for Central Europe by Brückner, and in each case the periods are of approximately 11 or 33 years and correspond to periods of high solar activity. The rainfall data at Uccle were treated in the same way as the temperature data alluded to above; but they did not exhibit the regular periodicity of tropical rainfall.

A careful study of the curve, however, showed that periods of low solar activity and high temperature are also somewhat drier.

The records of the water level of the Swiss lakes have also been studied. Abnormally high levels with intermediate abnormally low levels have been recorded every 30 to 40 years from 1700 onwards.

Finally a close connection has been traced between an increase in area of the sun spots, and increased magnetic disturbances on the earth.

To summarise: though the correlation between solar phenomena and terrestrial meteorological phenomena has not yet been completely worked out, it is a remarkable coincidence that a minimum solar activity should always be accompanied by a rise in temperature, a lowering of the rainfall and a reduction of electric and magnetic disturbances.

(1) See also No. 224, *B* March 1913.

(Ed.).

- 643 - Meteorological Conditions in a Field Crop, with a Description of two Simple Recorders. — BALLS, W. I. in *Quarterly Journal of the Royal Meteorological Society*, Vol. XXXIX, No. 166, pp. 109-113, London, April 1913.

The experiments were carried out in a cotton field in Egypt and showed that the cotton plants lower the temperature and raise the humidity of the surrounding air to a considerable extent, even at night when transpiration is reduced. A gentle breeze immediately raised the temperature and lowered the humidity, and the particular interest of the phenomenon to the plant physiologist lies in the rise of tissue temperature and the consequent increased growth-rate of the plant which is thus produced.

Two of the instruments used in taking the observations were of the author's own devising: one of them was used for measuring low wind velocities and the other for recording clouds at night.

AGRICULTURAL  
GEOLOGY

- 644 - Classification of the Soils in Glaciated Regions according to Size of Particles and Physical Properties. — FROSTERUS, BENJ. in *La Pédologie*, Year 11, No. 4, pp. 52-60. St. Petersburg, 1912.

After a short introduction explaining the use of the terms "Ablagerung" (earthy deposit) and "Boden" (soil), the writer, by means of tables giving the results of his soil investigations, shows that the mineral earthy deposits in glaciated regions are to be classified according to the size of their particles and their physical properties. In conclusion, he gives the type divisions of soil which should be indicated in field-mapping in Finland.

SOIL PHYSICS,  
CHEMISTRY  
AND  
MICROBIOLOGY

- 645 - Osmosis in Soils, and Possible Applications of the Principle. — 1. LYNDE C. J. Osmosis in Soils. Soils act as Semi-permeable Membranes. — *Journal of Physical Chemistry*, Vol. 16, No. 9, pp. 759-765 + 3 figs. December, 1912.  
2. LYNDE, C. J. and BATES, F. W. — *Ibid.*, pp. 766-781 + 2 figs.

In the first article, the writer shows by means of experiments that a clay subsoil acts from the osmotic point of view as a semi-permeable membrane (*i. e.* allows free passage to the molecules of water, but not to those of the dissolved substances in a given solution) and that water is moved through the soil by osmotic pressure.

The experiments described in the second article were made with clay subsoils and with others containing a high percentage of sand and a low percentage of clay.

They showed that for sterilized clay subsoil in the presence of water: 1) the soil acts as a semi-permeable membrane; 2) the efficiency of a column of soil as a semi-permeable membrane increases with its depth; 3) water moves through the soil towards a solution and develops a certain osmotic pressure; 4) the osmotic pressure developed increases with the temperature.

This theory is only substantiated by the experiments in the case of a heavy clay subsoil prepared by settling out of suspension in hot water in a centrifuge. No osmotic pressure was developed when a sandy soil was used.

The theory is suggestive for agricultural practice in the following ways :

*Tillage.* — The different operations of tillage promote the growth of bacteria, which increase the concentration of the soil solutions in the upper layers of soil. This in turn increases the osmotic pressure of these solutions, and therefore increases the amount of water raised from the lower depths through the subsoil.

*Drainage.* — It is well known that crops on drained land receive more moisture than those on undrained land. This may be due to deeper root system, but it may also be attributable to the fact that, in drained land, the water level is lowered to a depth of 3 or 4 feet below the surface. This permits air to enter to this depth, which promotes the growth of bacteria ; the latter produce more soluble salts and these increase the concentration of the soil solutions and thereby the osmotic pressure, so that a larger amount of water is lifted from below through the subsoil.

*Manure.* — Experiments made by King show that in land treated with manure well worked in, the rise of water is stronger than in land not so treated. This cannot be due to a greater capillary rise, but appears to be attributable to the increased number of bacteria, which produce a larger amount of soluble salts ; this increases the osmotic pressure of the soil solutions near the surface and therefore the amount of moisture raised through the subsoil.

*Mineral fertilizers.* — When mineral fertilizers are added to the land, the concentration of the soil solutions near the surface is increased ; this increases the osmotic pressure of these solutions, and, according to the writers' theory, should increase the amount of moisture raised through the subsoil.

*Increase of temperature.* — The rise of water in the soil, in so far as it is due to osmotic pressure, is increased by a rise in temperature in various ways.

*The soil mulch.* — Under a soil mulch the land is moist and warm and the conditions are ideal for bacterial growth. Thus the osmotic pressure of the soil solutions is increased and more water is raised through the subsoil.

*Dry farming.* — In dry farming it is the practice in some cases to plant a crop every other year, and to maintain a mulch on the land in the off year. The writers' theory suggests that the increased crop the second year is partly due to the increase in the osmotic pressure of the soil solutions near the surface owing to bacterial action, as explained under "soil mulch" above.

This theory opens up a large field for investigation in soils ; Amongst the questions for solution are the following :

- 1) Do soils other than clay subsoil act as semi-permeable membranes ?
- 2) Does the efficiency of a soil as a semi-permeable membrane depend upon the percentage of clay it contains ? If so, how ?
- 3) Do soils under field conditions act as semi-permeable membranes ?
- 4) Do the operations of tillage increase the amount of water raised through the subsoil ?

5) Are there substances, other than those at present known, which are not plant foods, but which can be used as fertilizers with benefit from the point of view of their action on the osmotic pressure of the soil?

646 - **The Partial Sterilization of Soil and the Nature of the Limiting Factor of Bacterial Development.** — RUSSELL, E. J. and HUTCHINSON, H. B. (Rothamsted Experimental Station) in *The Journal of Agricultural Science*, Vol. V, Part 2, pp. 152-221 + 7 figs. Cambridge, March 1913.

The writers have by these further experiments confirmed and extended the results reached in their previous paper (1). Fresh evidence is adduced that bacteria are not the only inhabitants of the soil, but that another group of organisms occurs, detrimental to bacteria, multiplying more slowly under soil conditions and possessing lower power of resistance to heat and to antiseptics.

In consequence of the presence of these detrimental organisms, the number of bacteria present in the soil at any time is not a simple function of the temperature, moisture content and other conditions of the soil. It may indeed, show no sort of connection with them; thus rise of temperature and increase of moisture content are found to be ineffective in increasing the bacteria in the soil. The number of the latter depends on the difference of activity of the bacteria and the detrimental organism.

Partial sterilization leaves the former unharmed, but kills the latter, as do antiseptic vapours or the heating the soil to 55 or 60° C. Whenever the treatment is sufficiently energetic to kill the bacteria, these micro-organisms rapidly increase as soon as the soil conditions are made normal. Once the detrimental organisms are killed, however, the only way of introducing them again is to add some of the untreated soil, but the precise conditions governing the transmission are unknown.

The writers provisionally identify the detrimental organisms of the soil with the active protozoa of the latter, but as the zoological survey is yet incomplete, they do not commit themselves to any definition of the term protozoa, nor to any particular organism, or set of organisms.

As there is a great diversity of opinion on this point (2) it may be well to mention some of the experiments made by the writers, who in all their sterilization operations, always sought for and obtained protozoa. The soil is inoculated into a one per cent. hay infusion and left in an incubator at 25° C for 4-5 days, examination being made periodically for protozoa; these are roughly grouped as ciliates, amoebae, and monads. Partial sterilization simplifies the fauna considerably, killing the ciliates and amoebae but often leaving certain monads. Whenever the ciliates and amoebae were killed, the investigators invariably found that the detrimental factor was extinguished; whenever the detrimental factor was not extinguished, the protozoa also were not killed.

The following are typical results for heated soils:

(1) See No. 14, B. Jan. 1913.

(2) See No. 467, B. May 1913.

(Ed.).

	Bacteria after 68 days. Millions per gram of dry soil	Ammonia and nitrate formed after 68 days. Parts per million of soil	Detrimental factor	Protozoa found
Untreated soil . . . . .	11.1	13	present . .	ciliates amoebae monads
Heated to 40° for 3 hours .	7.5	14.4	present . .	ciliates amoebae monads
Heated to 56° for 3 hours .	37.5	36.7	killed . . .	all killed

Treatment with toluene leads to similar results:

	Bacteria after 30 days. Millions per gram	Ammonia and nitrate formed after 30 days	Detrimental factor	Protozoa found
Untreated Soil . . . . .	8	24.5	present . .	ciliates amoebae monads
Toluened soil. . . . .	47.4	41.6	killed . . .	all killed but certain mo- nads

Quicklime also produces the same effect.

As the writers' methods of dealing with soil protozoa do not reproduce conditions in the soil, they abstain at this stage from laying too much stress on any relationship that comes out, but which may only be accidental, between their detrimental organisms and any of the ciliates, amoebae and monads that their methods reveal. But it seems safe to draw two conclusions: 1) the detrimental organisms possess the properties of protozoa and not of bacteria; 2) the presence or absence of the detrimental organisms is intimately associated with the presence or absence of a complex protozoan fauna.

The increase in bacterial numbers following after partial sterilization by volatile antiseptics is accompanied by an increase in the rate of ammonia production until a certain amount of ammonia and nitrate has accumulated, when the rate falls. Thus two cases arise: 1) when only small amounts of ammonia and nitrate are present, there is a relationship between bacterial numbers and the rate of ammonia production; 2) when large amounts of ammonia, or of ammonia and nitrate, are present there is no such relationship. The limit varies with the composition and condition of the soil.

Complications are introduced when the soil has been partially sterilized by heat, as the organic matter is decomposed and some of the bacterial varieties are exterminated. These effects become more and more pronounced as the temperature increases; the maximum number of bacteria are found in soils which have been heated to 60° C, while this is the minimum temperature necessary to kill the detrimental organisms.

At this temperature, we have the same relation between the two sets of organisms as obtains when the soil is treated with volatile antiseptics. Although bacterial numbers are at a minimum in soils heated to 100° C, the decomposition effected is at a maximum. With this exception, it is generally true that bacterial multiplication may go on without increasing the production of ammonia, but an increase in the rate of production of ammonia does not take place without bacterial multiplication.

The increase in bacterial numbers brought about by addition of bacteria from the untreated soil into partially sterilized soil leads to still further production of ammonia and nitrate, unless too large a quantity of these substances is already present. But the subsequent depression in bacterial numbers consequent on the development of the detrimental organisms is generally (though not always) without effect on the rate of decomposition, apparently because it does not set in until too late.

PERMANENT  
IMPROVEMENTS,  
DRAINAGE AND  
IRRIGATION

647 - Irrigation on the Southern Side of the Pyrenees. — DE CONTENSON in *Revue Économique Internationale*, Vol. I, No. 1, pp. 76-95 Brussels, January 15-20, 1913.

There are large tracts of fertile soil in Northern Spain which are rendered unproductive by lack of water, and with the mountain range close at hand and a proper utilization of its water resources, much might be done in the way of reclamation.

The Royal Irrigation Company of the Ebro Agricultural Syndicate has been established 19 years, and during that period the receipts for irrigation water have risen from £2106 in 1892 to £11 713 in 1910, forming 93 per cent of the total receipts at the latter date. The success of this company induced Sr. Romana to formulate a project for an immense system of water canalization which is to reclaim 300 000 hectares (740 000 acres) in Upper Aragon at a cost of 535 pesetas per hectare (£ 8 11s per acre).

The region covered consists of gentle slopes and wide plains with a gradual fall of about 1180 feet. At present it is estimated that 4000 hectares (nearly 10 000 acres) receive some irrigation of an irregular and un-

reliable kind, 196 000 hectares (484 300 acres) are unirrigated but produce meagre crops of cereals or are planted to a small extent with vines or olives, and 100 000 hectares (247 000 acres) are altogether uncultivated. The production is uncertain, and in periods of drought the population must either emigrate or starve. The value of the ground in this area may be stated as follows :

	Millions of pesetas	
4 000 hectares with irrigation at 1 500 pes. per ha. (£ 24 p. acre) . . . . .	4	(£ 160 000)
196 000 hectares not irrigated, but cultivated, at 450 pes. per ha. (£7 45 p. acre) . . . . .	88	(£ 3 520 000)
100 000 hectares uncultivated at 100 pes. per ha. (£ 1 12 s p. acre) . . . . .	10	(£ 400 000)
Total . . . . .	102	(£ 4 080 000)

With a reliable water supply its value would be :

	Millions of pesetas	
230 000 hectares suitable for cereals at 500 pesetas per ha. . . . .	345	(£ 13 800 000)
70 000 „ „ for intensive cultivation at 3 000 pes. per ha. (£ 48 p. acre) . . . . .	210	(£ 8 400 000)
Total . . . . .	555	(£ 22 200 000)

Even when the cost of the undertaking is deducted, a profit of over 500 pes. per ha. (£6 3s per acre) is obtained; further it is estimated that the annual gross returns will increase from 69 to 349 pes. per hectare (17s to £4 12s per acre). The annual rainfall varies from 8 to 20 inches, but as it is regular and evenly distributed an allowance of 8 in. of irrigation water would be sufficient to secure the cereal crops.

A description is given of a very successful piece of reclamation carried out on a small scale by a landlord in the zone of the Aragon-Catalogna Canal. The water has been brought 5 ½ miles from the main canal, and, in order to provide the necessary labour for the scheme, a small farm colony or model village has been established. The landlord bears all the expense of settling in the tenant or colonist, and of stocking the holding, and receives in return one half of the yields of corn and forage at harvest. The colonists, in addition to cultivating their holdings, undertake to reclaim a certain additional amount of fresh land every year. The contracts are entered into for six years, but any time previous to their expiration the tenant may pay back the expenses incurred on his behalf, and in that case a fresh arrangement is made, by which the tenant retains four-fifths instead of one half of his harvests. Though the system has only been working for three years, already half the loans have been repaid.

With regard to method of cropping, as well as in all other questions of farm management, the landlord reserves the right of imposing his

rules on the tenant. The reclamation of land is encouraged by paying a fair price (40 s per acre) for all work done by the tenant over and above his contract and, further, the landlord himself reclaims 18 to 20 hect. (44 to 49 acres) every year. In this way 200 hect. (494 acres) of barren land have been brought under cultivation at a cost varying from £ 5 8 s, per acre where the landlord himself bears the cost of the labour, to £ 4 per acre where the colonists supply the labour; profitable employment has been provided for several families, numbering in all 24 individuals; and the success of the experiment has induced other landlords to initiate similar systems on their estates, so that as the possible irrigation zone of the canal is 100 000 hect. (247 000 acres) it seems safe to predict that the population of the district will shortly increase to five times its present numbers and will more than justify the expenses incurred by the Government in the construction of the canal.

648 — **The Experimental Drainage Field at Josephsdorf, Germany.** — KRÜGER, E. in *Mitteilungen des Kaiser Wilhelm Instituts für Landwirtschaft*, Vol. V, Part „, pp. 173-185. Berlin, February 1913.

As is well-known, the beneficial effect of drainage is not only due to the removal of the superfluous water, but also to the subsequent aeration of the soil. Mierau in 1890, followed first by Klinkert, and recently by Friedersdorff, Holdefleiss and Heinze, showed the importance of studying aeration on experimental fields<sup>1</sup>; but unfortunately no observations have been made on the effect of such aeration.

Other points in draining which are of no less consequence are the depth and distance apart of the drains. It is surprising that the exact solution of a question of such great economic importance has been so long deferred. Kopecky was the first to show that the distance between the drains must be determined as a function of the mechanical composition of the soil and of the amount of water to be removed. He advocated therefore the mechanical analysis of the soil as a basis of drainage operations; his suggestion was followed and further developed by Fauser and Canz. Recently Breitenbach has tried to deduce from the hygroscopicity of the soil the right distances at which to place the drains (1).

Since the introduction of drainage the question of the most suitable depth for drains in heavy clays has been the subject of the keenest discussion.

There is no doubt that the solution of all these questions is of paramount practical importance. The Minister of Agriculture for Prussia, being convinced of this fact, transmitted, in 1908, Mierau's proposition to the Section of Agricultural Improvements, and entrusted the latter with the task of laying out an experimental field for the purpose of solving all these problems.

After a prolonged search, a field suitable for the purpose was found at Josephsdorf in the district of Culm, which its owner, Hr. Plehn, consented to lend for a period of 10 years. According to the project, the following points are to be studied :

(1) See No. 1271. B. Sept. 1912.

(Ed.).

1) Drainage with drains situated at different distances apart : 52, 40 and 26 ft.

2) Drainage at different depths : 5 ft., 4 ft. and 3 ft.

3) Drainage with and without aeration.

There are thus 18 variants.

The aim of the drainage experiments is the solution of the following questions : the influence of the variants on *a*) the production; *b*) the properties of the air circulating in the soil; *c*) the amount of water removed; *d*) the rapidity with which the rain water reaches the drains; *e*) the development of plant roots; *f*) the mechanical modifications of the structure of the soil.

These are the bases on which the project was elaborated, and the work was begun in March 1911. The field has an area of 8  $\frac{3}{4}$  acres ; the cost of preparation amounted to £ 97.

As the drainage works have only been one year in operation, it is necessarily impossible as yet to give any experimental results.

649 - **The Best Cross- Section for Ditches in Drainage Operations.** — SCHÖNFELDT, A. in *Der Kulturtechniker*, Year XVI, No. 2, pp. 130-134. Breslau, April 1, 1913.

In making intakes for water, and supply and drainage channels, which operations are the most costly items in irrigation and drainage work, it is necessary not only to take into consideration the quality of the work, but also the question of the financial and commercial basis of the latter. This question can only be solved in a satisfactory manner, when the increased production due to the work not only defrays the depreciation and upkeep expenses, but also permits of the formation of a reserve fund, *i. e.* when the interest on the capital expended is at least 5 per cent.

Thus in the choice of section it is necessary, apart from theoretical considerations, to have some idea of the relation between the cost and the section, and to choose the smallest form of section which (with the existing fall) will ensure the amount of water required. The formulae of Ganguillet and Kutter are generally employed in making these calculations. From the examples mentioned by the writer it appears that the semicircle where the surface of the water flows through the centre of the circle presents the smallest section. Unfortunately this form of section cannot be used and it is necessary to change the semicircle into a trapezoid in order to reconcile theory and practice.

650 - **The Effect of Loosening the Subsoil on Yield.** — AUGSTIN in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 32, pp. 303-304. Berlin, April 19, 1913.

In loosening the subsoil, as well as in the construction of subsoiling implements, two tendencies have to be sharply distinguished: one strives to loosen as much as possible of the subsoil to the same depth by means of the broadest possible implement, and without mixing the loosened subsoil with the upper layer; the other endeavours to cut by means of a spring chisel-shaped subsoiler the deepest possible groove about 1  $\frac{3}{4}$  inch wide in the bottom of the furrow, with the result that a part of the loosened subsoil falls again into the groove, while the greater part in a state of fine division gets mixed with the upper layer. In order to investigate the relative ad-

TILLAGE AND  
METHODS OF  
CULTIVATION

## A. Zieckau Experiment Field.

*Lochow's yellow oats.*

Plot	Yield per plot of $\frac{1}{16}$ acre		Average yield per acre	
	Grain	Straw	Grain	Straw
	lbs.	lbs.	lbs.	lbs.
I. Shallow ploughing . . . . .	770.5	971 3	2391	2961
V. Duplicate . . . . .	706.5	858.8		
II. Shallow ploughing with groove sub- soiling . . . . .	723.1	1040.8	2444	3300
VI. Duplicate . . . . .	787.0	998.9		
III. Shallow ploughing with subsoiling of whole width. . . . .	703 2	917 3	2244	2787
VII. Duplicate. . . . .	683 4	804.8		
IV. Deep ploughing . . . . .	723.1	829 1	2264	2731
VIII. Duplicate . . . . .	675.7	858 9		

vantages of the two systems and to compare the effects of deep and shallow ploughing, the writer conducted some cultivation experiments at Friedeberg and at Zieckau in the autumn of 1911, on two fields each 1 hectare (2.47 acres) in extent. At Friedeberg the soil of the experiment field is a sandy loam with similar subsoil; at Zieckau, it is a slightly humous and loamy sand with compact loamy sand as subsoil.

At Zieckau only oats were grown; at Friedeberg half of the area bore oats and the other half barley. The various plots, save for the ploughing, were all of them treated in exactly the same way. The results are shown in Tables A and B.

From these experiments it appears that under some circumstances shallow tillage is more profitable than the more extensive loosening of the subsoil. The richer the upper layer, and the better, more compact and richer the subsoil, the greater success will attend the loosening of the subsoil. Making a groove in the bottom of the furrow requires much less expenditure of power than loosening the subsoil over the whole width of the furrow with a broad subsoiler, so that even with an equal yield the first method would be preferable; but the experiments show that in two cases out of three the plots with the grooves cut in the bottom of the furrow yielded more than the plots in which the whole of the subsoil had been loosened. It is probable also that the effects of the first method last longer on account of the solid balks of earth which remain and support the upper layer and prevent the loosened subsoil being compressed again too soon.

*B. Friedeberg Experiment Field.**1. Original Lagowo oats.*

Plot	Yield per plot of $\frac{1}{32}$ acre		Average yield per acre	
	Grain	Straw	Grain	Straw
	lbs.	lbs.	lbs.	lbs.
I. Shallow ploughing . . . . .	425.5	487.3	2680	3133
V. Duplicate . . . . .	402.3	481.8		
II. Shallow ploughing with groove sub- soiling . . . . .	459.7	521.5	2876	3331
VI. Duplicate . . . . .	428.8	511.6		
III. Shallow ploughing with subsoiling of whole width . . . . .	437.6	505.0	2933	3347
VII. Duplicate . . . . .	468.5	529.2		
IV. Deep ploughing . . . . .	394.6	470.3	2904	3340
VIII. Duplicate . . . . .	502.7	554.6		

*2. Original Bethes II barley.*

I. Shallow ploughing . . . . .	377.1	426.5	2469	2858
V. Duplicate . . . . .	387.0	458.6		
II. Shallow ploughing with groove sub- soiling . . . . .	384.8	457.5	2590	3468
VI. Duplicate . . . . .	401.3	503.8		
III. Shallow ploughing with subsoiling of whole width . . . . .	368.2	435.5	2490	3011
VII. Duplicate . . . . .	402.4	496.1		
IV. Deep ploughing . . . . .	340.7	406.8	2462	3040
VIII. Duplicate . . . . .	421.2	532.5		

The writer, wishing to investigate the question thoroughly, will repeat these experiments for several years and will include in them experiments on the moisture and bacterial content of the soil.

651 - **The Possibilities of Profitable Cultivation in the Dry Districts of Ceylon.** — FERNANDO, H. M. (A paper read at the meeting of the Ceylon Board of Agriculture). — *The Tropical Agriculturist*, Vol. XL, No. 2, pp. 100-102. Colombo, February 1913.

Ceylon may be divided into three zones; the moist and dry low country areas, and the hill country. Leaving the hill country aside, the moist low country area which is situated in the south-west of the island is where the perennial crops (coconut, tea, rubber, etc.) are cultivated; the dry low-

land area, which occupies more than half the island, remains for the most part either impenetrable jungle or barren waste, except where irrigation water exists or special conditions of underground water obtain. The rainfall on this dry zone is seldom less than 40 inches and frequently rises to 50 inches, the major part of which falls in the months October-January. This period is followed by a drought, then by a few gentle uncertain rains in April-June, and a further drought.

The chief difference between the dry and the moist area, therefore, lies in the failure of the south-west monsoon over the former; in spite of this, the rest of the rainfall is sufficient to raise one crop per annum, and native cultivators do use it to a certain extent for the production of grain under a very primitive system of agriculture. But with the introduction of dry farming methods, the production of other and more valuable crops should be possible.

Of these, two are suggested as specially suitable — the one being fodder to take the place of the large quantities of hay imported from Australia, and the other cotton, which could be planted in October, grow with the rains, and ripen during the unfailing drought of February and March. Preliminary trials indicate that both these crops would be quite successful, but more evidence is required before they can be recommended with confidence, so that the necessity of starting experimental farms in the dry districts is quite evident.

MANURES  
AND  
MANURING

652 — **The Price of Nitrogen.** — BERTRAND, A. (Delegate for the Nitrate of Soda Service in Europe). *Le Marché mondial de l'azote en 1911 et 1912. Rapport présenté au Ministre des Finances du Chili.* — Reprinted from *L'Engrais*, of March 14 and 23, 1913, pp. 12 + VIII graphs. — 2. BRADBURY and HIRSCH's *Review of the Market for Sulphate of Ammonia during 1912*, pp. 37 + 3 tables. London. — 3. *Revue commerciale de la Semaine.* — *Les Mercures Agricoles*, *passim*. Antwerp, 1913.

Recently there has been a general rise in the markets of the prices of fertilizers and especially of nitrate of soda. In fact the prices of nitrate of soda have risen since 1910 and lately have come very near the highest quotations of 1906, that is the time of the so-called nitrogen crisis (1).

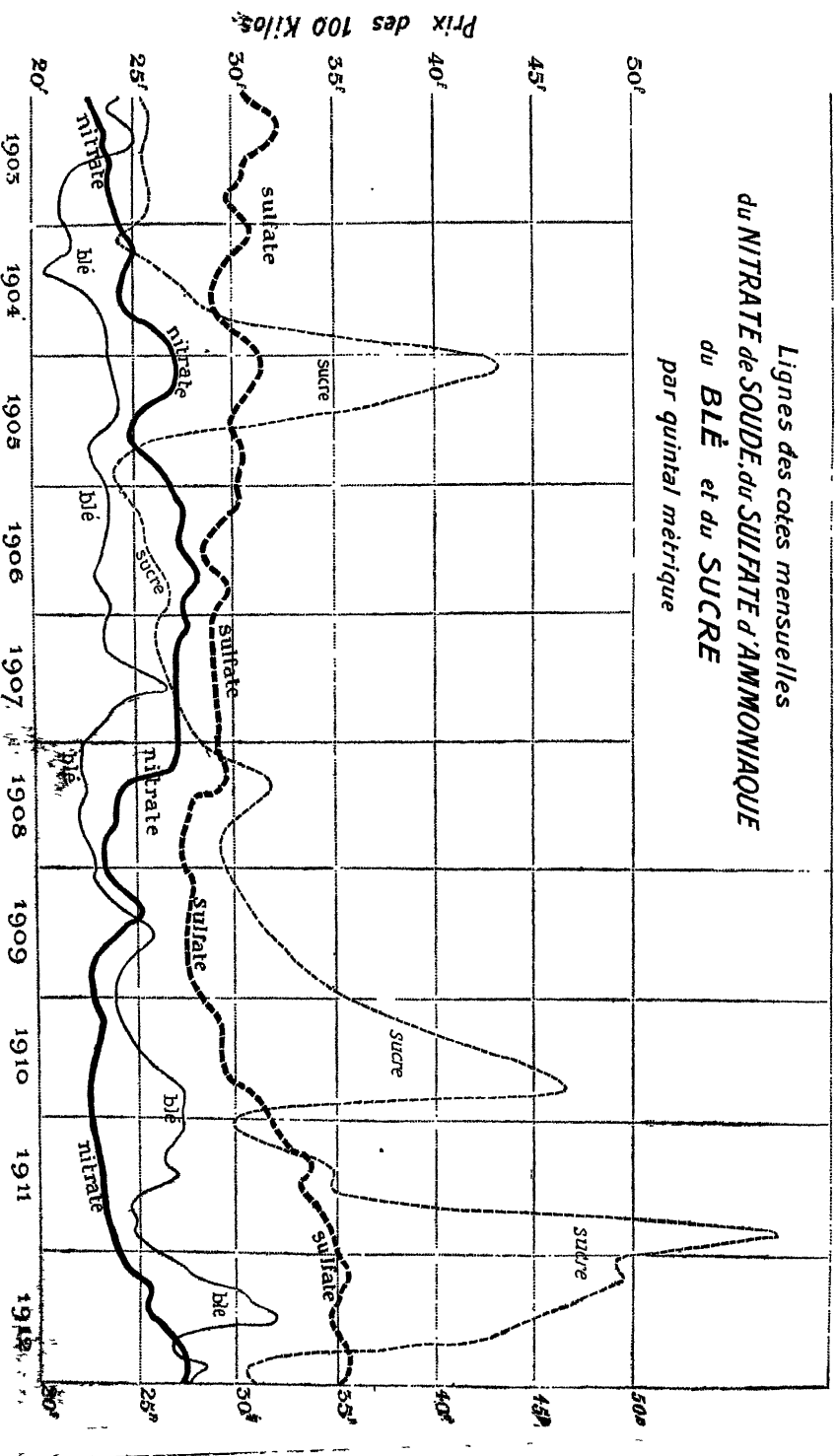
According to M. Bertrand the increase in the price of nitrogen, which before 1906 was attributed to nitrate of soda, should now be attributed to sulphate of ammonia, admitting the manurial equivalence of nitric and ammoniacal nitrogen. The increase in the price of nitrogen is, however, considered by M. Bertrand as a special manifestation of the increased prices universally observed and recognised for all the staples of international trade. And if such general rise is due to the diminished purchasing power of gold and to the extent of 30 per cent. between 1910 and 1912 (J. Fisher, *Quarterly Journal of Economics*, Jan. 1913), starting from the price of 10s 1d per cwt., considered as the normal price of nitrate in 1910, M. Bertrand thinks that the present price of 11s 3 1/2d is still within normal limits.

(1) See: *Production et consommation des engrais chimiques dans le monde.* International Institute of Agriculture, 1913. (Ed.)





Lignes des cotes mensuelles  
du NITRATE de SOUDE, du SULFATE d'AMMONIAQUE  
du BLE et du SUCRE  
par quintal métrique





# A. BERTRAND - Le marché de l'Azote en 1911 et 1912

## GRAPHIQUE IV Cotes hebdomadaires de l'AZOTE en 1911/12 en NITRATE de SOUDE

à Hambourg, Liverpool, Dunkerque, Anvers, New-York et à la côte du Chili

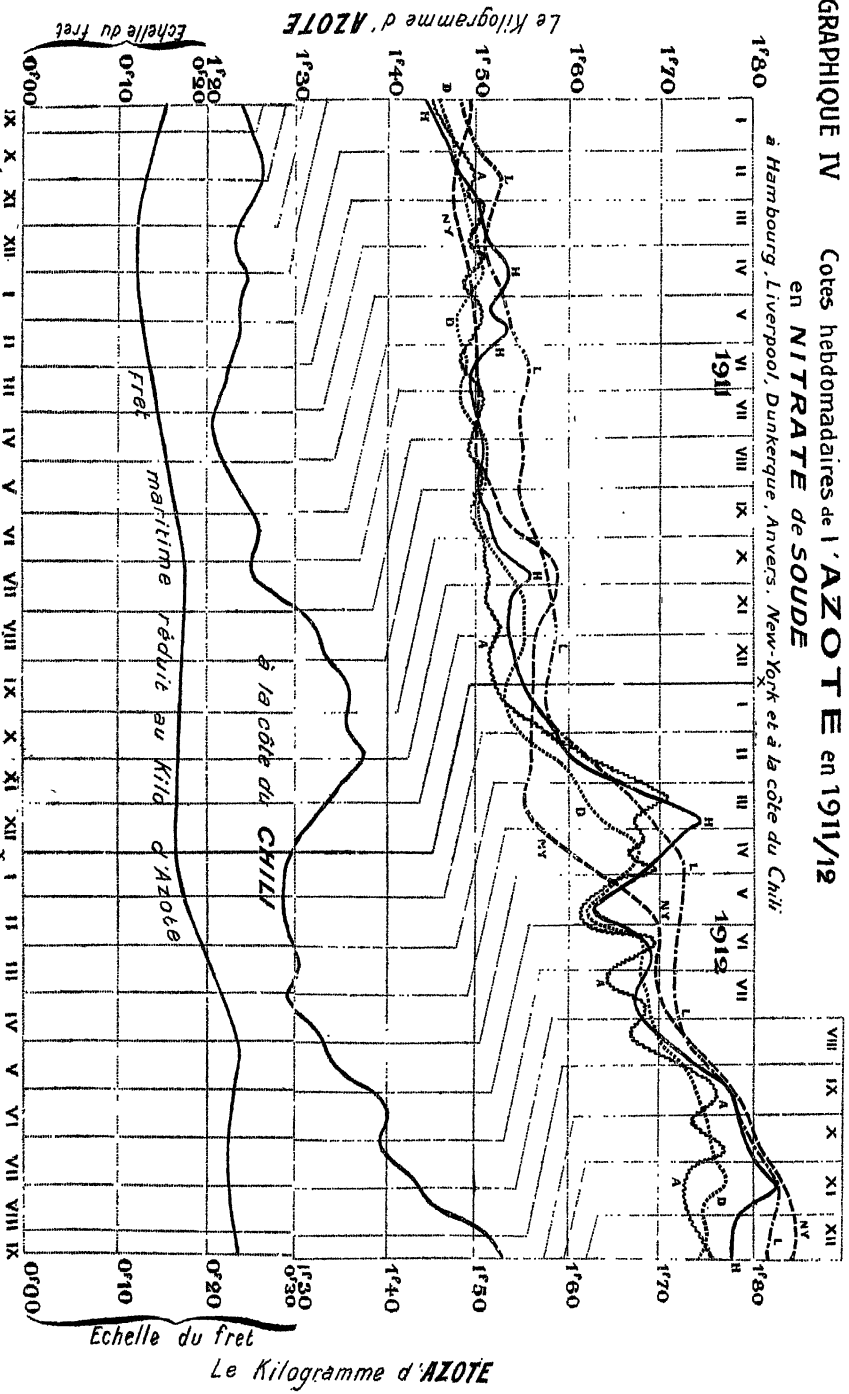


Diagramme 2. — Weekly prices of nitrate of soda per kilogram of nitrogen in the principal European ports, on the coast of Chile, and freights (Fret maritime) reduced to kilogram of nitrogen. H, Hamburg; L, Liverpool; D, Dunkerque; A, Antwerp; NY, New York



# A. BERTRAND — Le Marché de l'Azote en 1911 et 1912

GRAPHIQUE V

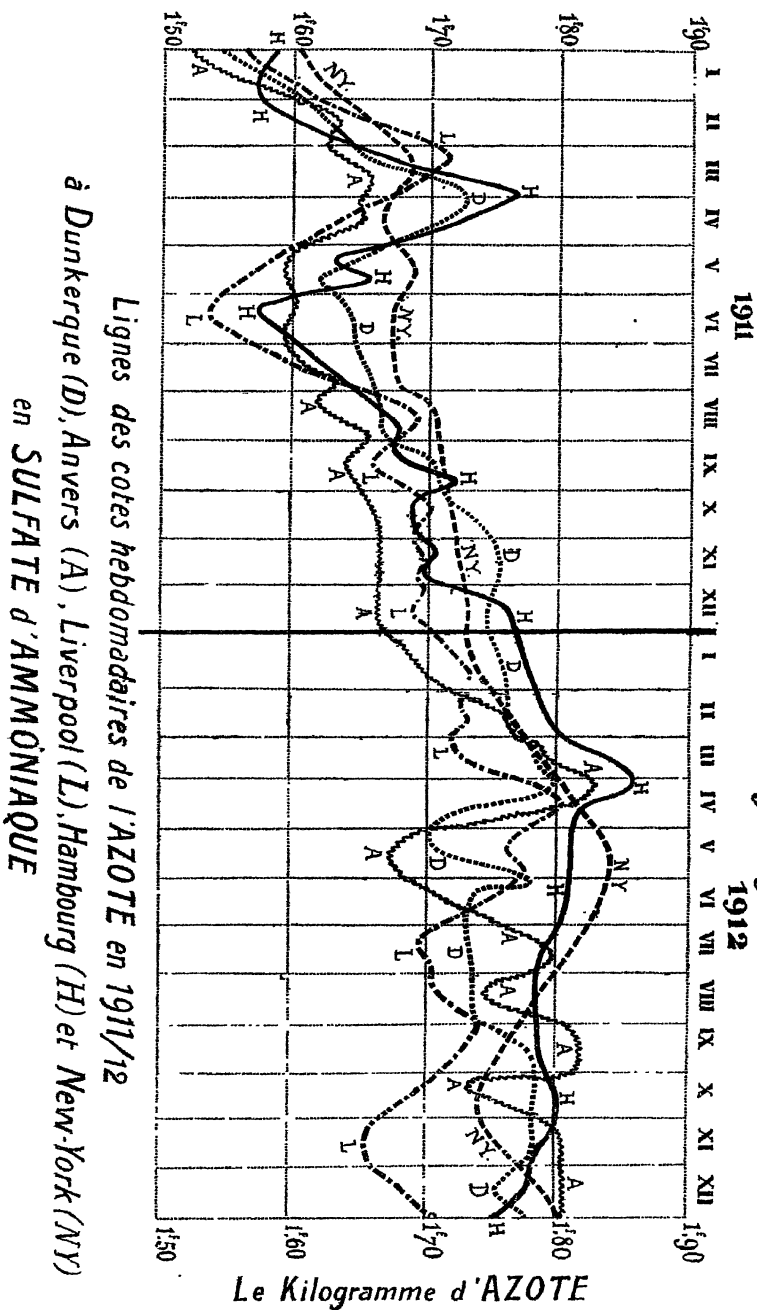


Diagram 3. — Weekly prices of nitrogen in 1911-12 at Dunkirk (D), Antwerp (A), Liverpool (L), Hamburg (H) and New York (N.Y.).



A. BERTRAND. — *Le Marché de l'Azote en 1911 et 1912*  
 Lignes des cotes Hebdomadaires de l'AZOTE en 1911/12  
 en NITRATE de CHAUX et CIANAMIDE

Graphique VI

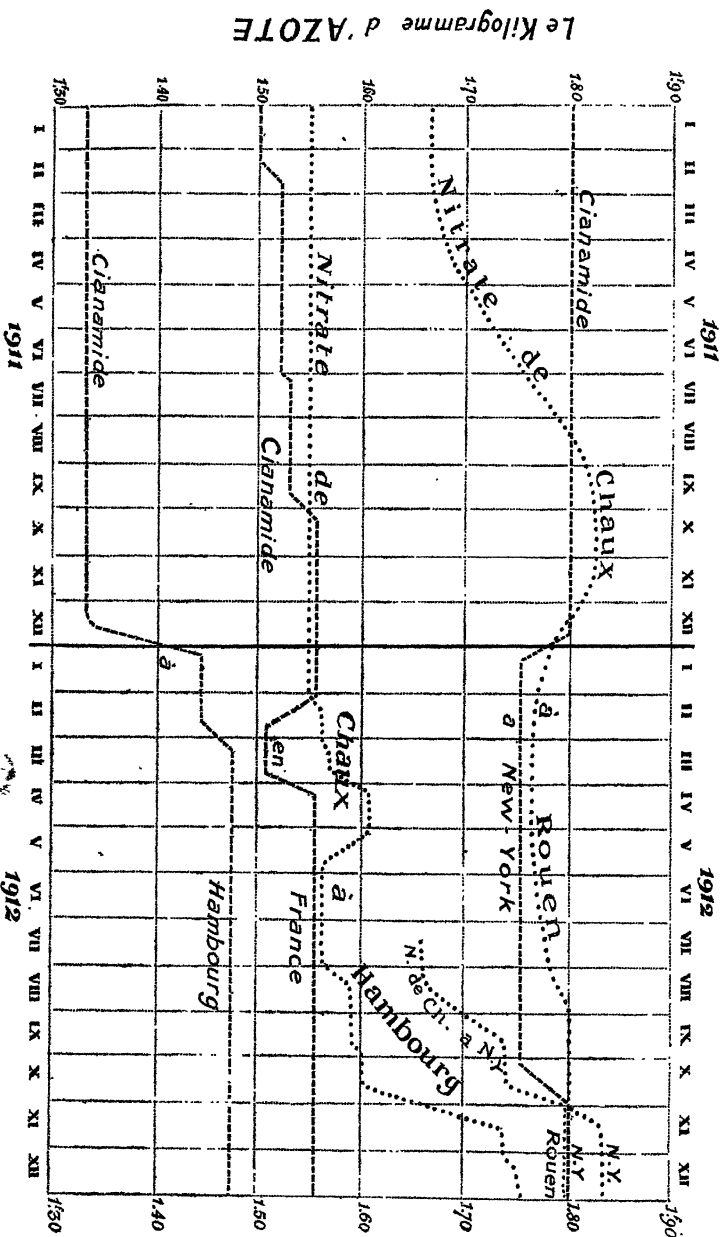


Diagram 4. — Weekly prices of nitrogen per kilogram in 1913 in nitrate of chaux (Nitrate de chaux) and in cyanamide (Cyanamide).



A. BERTRAND — *Le Marché de l'Azote en 1911 et 1912*

GRAPHIQUE VII

# LIGNES MOYENNES

des cotes mondiales de l'AZOTE nitrique et ammoniacal  
en 1911 en 1912

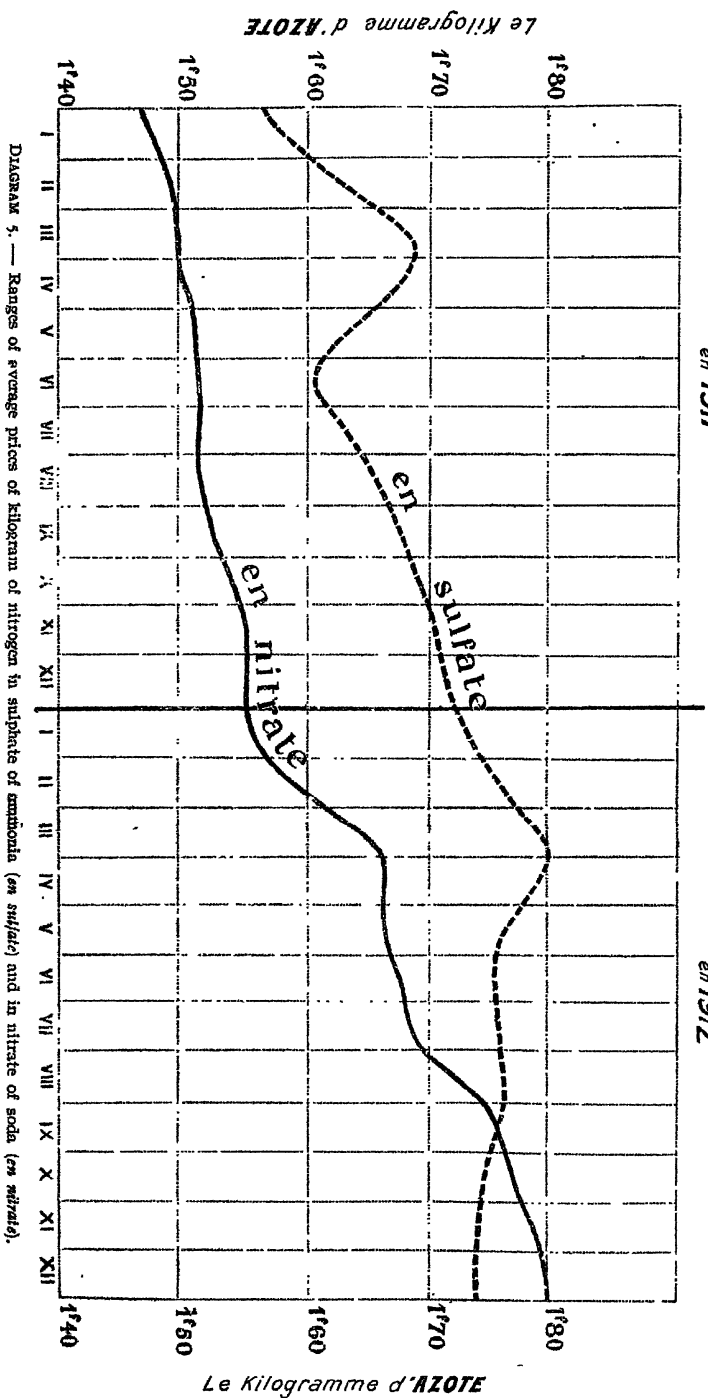


Diagram 5. — Ranges of average prices of kilogram of nitrogen in sulphate of ammonia (*en sulfate*) and in nitrate of soda (*en nitrate*).



In confirmation of the above he shows in diagram 1 the fluctuations in the price of sulphate of ammonia and of nitrate of soda compared with those of sugar and of wheat (1).

Diagrams 2, 3, 4 and 5 show sufficiently the details of the oscillations in the price of nitrogen in its various forms during 1911 and 1912.

On the above diagrams, M. Bertrand makes the following observations :

a) The lines representing the prices in the various markets of consumption do not deviate so much from each other, while their parallelism with the line representing prices on the coast of Chile is less regular.

b) The yearly rise in the price of nitrate of soda which takes place at the season of consumption was less accentuated during the last two years than in the preceding years.

c) The irregularities and deviations in the sulphate of ammonia markets are relatively more marked.

d) According to diagram 4, it appears that nitrate of lime has a tendency of its own towards an increase in price.

e) In cyanamide, the unit (one kilogram per quintal) of nitrogen is, in Europe, from 1d to 1½d cheaper than in the other nitrogenous fertilizers: in the United States the reverse seems to be the case.

f) Diagram 5 shows that nitrate of soda, referred to the kilogram of nitrogen in part at least, has resumed higher quotations than sulphate of ammonia.

The following figures, taken from Messrs. Bradbury and Hirsch's *Review of the Markets for Sulphate of Ammonia during 1912*, will assist in giving an idea of the present conditions of the nitrogen market.

*Average prices of nitrate of soda, 1903-1912,  
in Liverpool, 95 per cent., per cwt.*

		d		s	d
1903 . . . . .	9	6 ½	1908 . . . . .	10	2 ½
1904 . . . . .	10	2 ½	1909 . . . . .	9	9
1905 . . . . .	10	9 ½	1910 . . . . .	9	4 ½
1906 . . . . .	11	4	1911 . . . . .	9	10 ¾
1907 . . . . .	11	2	1912 . . . . .	11	1

1912.

Jan. . . . .	10	0 ¾	July . . . . .	11	0
Feb. . . . .	10	4 ½	Aug. . . . .	11	3
March . . . . .	10	10 ½	Sept. . . . .	11	5 ¾
April . . . . .	11	0 ¾	Oct. . . . .	11	6 ¾
May . . . . .	11	0 ¾	Nov. . . . .	11	9
June . . . . .	11	0	Dec. . . . .	11	7 ½

*Average prices of sulphate of ammonia, 1903-1912,  
good grey 24 per cent. f. o. b. Hull., per ton.*

	£	s	d		£	s	d
1903 . . . . .	12	9	2	1908 . . . . .	11	12	0
1904 . . . . .	12	3	8	1909 . . . . .	11	5	0
1905 . . . . .	12	10	9	1910 . . . . .	12	3	2
1906 . . . . .	12	0	9	1911 . . . . .	13	15	3
1907 . . . . .	11	15	8	1912 . . . . .	14	7	9

## 1912

Jan. . . . .	14	7	2	July . . . . .	14	3	9
Feb. . . . .	14	8	1	August . . . . .	14	7	0
March . . . . .	14	11	3	Sept. . . . .	14	8	5
April . . . . .	14	19	1	Oct. . . . .	14	2	2
May . . . . .	14	14	1	Nov. . . . .	13	17	0
June . . . . .	14	11	3	Dec. . . . .	14	3	5

Messrs. Bradbury and Hirsch recognise the exceptional rise in freight rates, which resulted in an advance of about 50 per cent. in nitrate of soda freights, causing an increase of prices in Liverpool of 6  $\frac{1}{4}$ d more than on the Chile coast, but still leaving an ample margin for the producers. Messrs. Bradbury and Hirsch believe that the price of sulphate of ammonia depends at present upon the capacity of the German market to cover the offers of the producers; should it fail to do so, these would be obliged to have recourse to foreign markets.

The following figures based on the wholesale prices at Antwerp are taken from the *Mercuriales agricoles*. They indicate the present trend of the market.

	Price per kilogram (2.2 lbs.) of nitrogen	
	End of January 1913 frs.	End of April 1913 frs.
Nitrate of soda . . . . .	1.82	1.65
Sulphate of ammonia . . . . .	1.78	1.64
Calcium cyanamide . . . . .	1.57	1.57
Nitrate of lime . . . . .	1.76	1.82

653 - **Experiments with Phosphatic Manures in Uruguay, 1907-1912.** - SCHRÖDER, J. (Agricultural Institute of Montevideo) in *Revista de la Asociación Rural del Uruguay*, Year XLII, No. 2, pp. 94-98. Montevideo, February 1913.

A question which is at present very important for the agricultural economy of Uruguay is that of the use of manures. The analysis of the soils shows a relative poverty of phosphoric acid (for instance, from 0.03 to 0.05 per cent.  $P_2O_5$  soluble in 25 % hydrochloric acid). These experiments are specially important from the fact that they have been made under a sub-tropical climate and with the phosphatic by-product of the

Fray Bentos meat factories (bone meal, bone ash, guano) in comparison with basic slag and superphosphate.

*Results of the Experiments.*

	Crop per acre — grain — lbs.	Increase per acre — grain — lbs.		
<i>Maine (1908)</i>				
Without manure . . . . .	3381	—		
Bone meal . . . . .	4426	1045		
Guano . . . . .	4669	1289		
	Roots — lbs.	Dry matter — lbs.	Dry matter — lbs.	
<i>Manzolds (1909)</i>				
Without manure . . . . .	14 698	1 793	—	
Bone meal . . . . .	49 247	5 135	3 342	
Superphosphate . . . . .	43 715	4 384	2 590	
Basic slag . . . . .	43 403	4 749	2 956	
	Straw — lbs.	Grain — lbs.	Straw — lbs.	Grain — lbs.
<i>Rye (1910)</i>				
Without phosphatic manure . . . . .	2 855	713	—	—
Bone meal . . . . .	3 212	981	357	268
Bone ash . . . . .	3 301	1 070	446	357
Superphosphate . . . . .	3 301	981	446	268
	lbs.	lbs.	lbs.	lbs.
<i>Potatoes (1911)</i>				
Without phosphatic manure . . . . .	4907	—	—	—
Bone meal . . . . .	5799	—	892	—
Superphosphate . . . . .	5977	—	1070	—

A special experiment was conducted on plots of 63 sq. yards with rye, for the comparison of bone meals of various degrees of fineness :

	Crop		Increase	
	Straw — lbs.	Grain — lbs.	Straw — lbs.	Grain — lbs.
Without manure . . . . .	35.20	9.35	—	—
Bone meal, commercial . . . . .	38.50	11.90	3.30	2.64
"    coarse . . . . .	38.50	10.78	3.30	1.43
"    fine . . . . .	42.90	13.75	7.70	4.40
"    very fine . . . . .	41.58	13.64	6.38	4.29
Bone ash . . . . .	41.25	13.31	6.05	3.96
Superphosphate (Lawes) . . . . .	44.00	12.76	8.80	3.41

These results confirm the usefulness of phosphatic manures for the soils of Uruguay. The differences observed are within the limits of experimental error. Only coarse bone meal has given, during the first year of the experiments, inferior results, thus corroborating the evidence already obtained in other places as to the influence of the fineness of the meal used.

654 - Calcium as an Antitoxin to Certain Nutritive Salts in Water-Cultures of Peas and Lupins. — ROBERT, C. in *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 11, pp. 915-918. Paris, March 17, 1913.

Pea seedlings, after having been started in pure distilled water (*i. e.* redistilled over glass) were transferred to the following solutions :

- 1) Magnesium sulphate,  $MgSO_4$  . . . . . 250 mg. per litre
- 2) Potassium phosphate,  $H_2KPO_4$  . . . . . 500 mg. per litre  
or potassium sulphate,  $K_2SO_4$  . . . . . containing an equivalent amount of K
- 3) Ammonium nitrate,  $NH_4NO_3$  . . . . . 500 mg. per litre  
or ammonium sulphate,  $(NH_4)_2SO_4$  . . . . . containing an equivalent amount of  $(NH_4)$

All such plants immediately ceased to grow and appeared to find their medium thoroughly toxic, but when calcium sulphate was added in the proportion of 500 mg. per litre, the toxic effect was completely neutralized ; nor did it appear when the seedlings were transferred to a solution of calcium sulphate alone.

The following figures were obtained in two sets of experiments :

	Dry weight in mg.		
	Root	Shoot	Total
I. *			
Redistilled water . . . . .	10.5	18.5	29.
$CaSO_4$ . . . . .	16.6	47.6	64.2
$MgSO_4$ . . . . .			17.6
$H_2KPO_4$ . . . . .	8.1	10.5	18.6
$K_2SO_4$ . . . . .	7.3	16.3	23.6
$MgSO_4 + CaSO_4$ . . . . .	17.0	45.3	62.3
$H_2KPO_4 + CaSO_4$ . . . . .	12.8	45.5	58.3
$K_2SO_4 + CaSO_4$ . . . . .	14.7	42.8	57.5
II. **			
Redistilled water . . . . .	11	16.2	27.2
$CaSO_4$ . . . . .	18	38.7	56.7
$NH_4NO_3$ . . . . .			13.5
$(NH_4)_2SO_4$ . . . . .			13.7
$NH_4NO_3 + CaSO_4$ . . . . .	20	39.6	59.6
$(NH_4)_2SO_4 + CaSO_4$ . . . . .	19	36	55

\* Mean weight of 6 seedlings.

\*\* , , , 8 ,

The experiments lasted 12 days and the temperature varied from 20° to 25° C.

The growth was practically the same whether the calcium sulphate was supplemented by other salts or not, and it would seem, therefore, that salts of potassium, magnesium, and ammonium do not play an important part in the nutrition of the pea seedling during its early development.

The antitoxic effect of calcium with regard to copper was also shown by growing a set of plants in ordinary copper still water, when the following results were obtained :

	Length in mm.		
	Root	Shoot	Total
Redistilled water . . . . .	64	43	107
Copper still " . . . . .	19	36	55
" " " + $\text{CaSO}_4$ . . . . .	36	83	119

The experiments were repeated with white lupins, which proved even more sensitive than the peas to the toxic action of the nutritive salts; but, on the other hand, wheat and maize gave far less decided results, and with them potassium salts in the concentrations mentioned above hardly appeared noxious at all. The investigations are being continued.

655 - **Modifications and Mutations of Tuberous Plants.** - LABERGE in *Bulletin des Séances de la Société Nationale d'Agriculture de France*, Vol. LXXIII, No. 2, pp. 157-161. Paris, 1913.

The writer mentions his previous investigations and those of Eckel and Verne on the mutations which have been observed to occur in *Solanum Commersoni*. These investigations were made in Poitou in 1912 and under unfavourable conditions from the point of view of insolation.

Nevertheless, the following points are worthy of notice: 300 plants were grown in different nutritive media, ranging from pure sand to arable soil, with the addition of 5, 10 and 25 per cent. in weight of a fertilizer consisting of the following substances:

	Per cent.
Well-rotted dung . . . . .	25
Rabbit dung . . . . .	12.5
Chicken guano . . . . .	12.5
Horse dung . . . . .	10
Leaf-mould and well-rotted dung . . . . .	20
Grape pomace and lime . . . . .	20

The tubers which showed a tendency to mutation in preceding years, when put into pure sand evinced clear signs of retrogression to the wild species, with abundant and prominent lenticels and rough skin; the flowers reassumed their very long styles, their deeply divided corolla, and blunt sepals. While on the other hand forms in contact with *S. tuberosum*, such as Early Rose, Merveille d'Amerique and Violet Commersoni 1-01, maintained their modifications, which were much accentuated by the application of the above-mentioned fertilizer.

Another series of experiments was carried out with wild *S. Commersoni* collected in 1911 and compared with similar tubers gathered in 1910, which had been kept dry. The fertilizer had no effect upon the former, beyond causing a variation in the yield; but the tubers of 1910, which had got very dried up, presented the following characters:

Pure sand: wild type maintained.

With 5 % fertilizer: wild type maintained with slight modification.

" 10 % " : four round regular tubers, almost without lenticels, modified.

" 25 % " : four round tubers, one almost without lenticels, much modified.

The writer considers that, given a season of full sunshine, the modifications would give rise, as in 1901, 1904, 1906 and 1907 to complete mutations. In any case, the results leave no doubt as to the great effect of vicinity increased by the application of manure.

A third set of experiments showed that 1.1 per thousand of manganese sulphate causes the medium to be infertile and entirely suppresses the development of tubers; with 5 per cent. fertilizer and 0.55 per thousand of manganese sulphate, the tubers were very irregular and few in number; with 25 per cent. of manure, the same amount of manganese allowed a more abundant development of tubers, but these were very irregular if the plants producing them were derived from much modified tubers.

The facts may be summarized as follows:

- 1) Plants in contact preserve their clear tendency to mutation, and fertilizers increase this action to the point of making the crops resemble in a marked degree the ordinary *S. tuberosum*.
- 2) Any drastic treatment of the tubers, such as prolonged desiccation, facilitates the action of the fertilizer, which, however, has not so much effect as when it is used in conjunction with contact action.
- 3) Large amounts of manganese paralyse the property of tuber production, while the effect of a small dose is yet to be determined.

656 - **Influence of Radio-activity on Germination.** — PETT, G. and ANCELIN, R.: in *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 11, pp. 903-905. Paris, March 17, 1913.

Seeds of rye grass, wheat and maize were germinated between sheets of damp blotting paper. In one set the water used for damping had a radio-activity of 0.089 mg.-min. per litre, while in a set of controls ordinary water was employed. In each case the radio-active water had a remarkably stimulating effect on the grains, though this effect did not become apparent till about the twelfth day after the commencement of the experiment.

**PLANT  
BREEDING**

657 - **On Cleistogamy in Rice (*Oryza sativa*) and the Possibility of Cross Fertilization.** — FARNETI, RODOLFO in *Atti dell'Istituto Botanico dell'Università di Pavia*, Series II, Vol. XII, pp. 351-362, plate XIV. Milan, 1913.

The writer has been able to observe that the pales of rice never open, before, during or after the dehiscence of the anthers. Consequently the natural production of hybrids is impossible, even as a chance occurrence. All the varieties and forms in cultivation must have sprung from mutations. The great number of these may be explained by the marked diversity in the conditions of surroundings, climate and cultivation to which rice is subjected.

Rice is therefore a cleistogamous plant, but is exceptional among such in possessing flowers of only one type, with perfectly formed gynoecium and androecium. It is cleistogamous in that no natural internal pressure can open the flowers, as this is mechanically prevented by a hinging of the edges of the two pales throughout their length. This is perhaps a unique type of cleistogamy and presents much interest; it should be noted that

*Leersia oryzoides*, which is one of the few other cleistogamous grasses, and is a marsh plant closely related to rice, presents two types of flowers as is usual in cases of cleistogamy.

It is well known that climate and special conditions tend to modify the mechanism of pollination; it was therefore interesting to find out whether cleistogamy occurs in all varieties of rice and in all places where it is grown, or whether exceptions occur as in other cleistogamous plants, not excepting the species of *Leersia*. An examination was therefore made of 23 varieties of rice grown in Japan, sent direct from Nisigura, and of several varieties indigenous in Italy or introduced at various dates from abroad: not a single exception was found.

The cause of the cleistogamy of rice is presumably hereditary. *Oryza sativa* is a native of river banks and flooded land in Indo-China; in this country during its period of growth torrential rains occur daily, accompanied by flooding of the rivers. If the rice flowers opened, their fertilization would certainly be interfered with, if not prevented.

As natural hybridization is excluded, the writer attempted to find out whether there was any possibility of making artificial cross-fertilization. The practical results obtained by crossing in many cultivated plants, and especially in cereals, are such as to encourage any attempt at hybridizing rice, either by cross-fertilization or grafting. The production of hybrids by the latter means is, however, much disputed. With rice it was attempted as long ago as the beginning of the 18th century by Gianverardo Zeviani of Verona; he was the first to attempt grafting on rice, and indeed on any gramineous plant, with the idea of reinvigorating the species, which he believed to be degenerate. But the grafted plant did not give good results.

In the writer's experiments on hybridizing by artificial cross pollination, all the flowers artificially opened, whether or not the stamens were destroyed, remained unfertilized, while all those not operated on set seed.

He believes the failure was due not to lack of skill, or to the damaging of the flowers, but to other causes which remain to be investigated. He suggests a lack of sufficient moisture of the air within the opened flowers, as evaporation within the naturally closed ones would obviously be very limited. The experiments are to be repeated, and the plants dealt with will immediately be placed in a damp atmosphere, either under bell-jars or in forcing houses.

If the sterility of the flowers artificially opened but not mutilated was due solely to this cause, artificial crossing of rice, though very difficult, cannot be considered impossible. All will depend on the skill and patience of the operator.

658 — **Particulate Inheritance.** — BLARINGHEM, L. Sur l'hérédité en Mosaïque. — *IV Conférence Internationale de Génétique, Paris, 1911*, pp. 101-131. Paris, 1913.

In his works published in 1862-63, Charles Naudin pointed out that the characters of two parent species are not always uniformly distributed in all parts of their hybrid offspring, but that sometimes visible patches of the one parent occur side by side with visible patches of the other parent,

the patches being apparently perfectly pure and free from all mixture, forming a kind of living mosaic. This conception extended to the germ cells supposed that the specific essences never really fused together to form a homogenous whole, but that they remained distinct and were for ever struggling to break away from one another. The tendency of the specific elements of each type to accumulate in visible patches is increased by cuttings and becomes more accentuated as the plant gets older, being especially developed at the time of the formation of the ovules and pollen grains. At such a time, if the separation is complete, returns to the parent species might be obtained amongst the offspring of hybrids. This hypothesis would account for the first hybrid generation being generally uniform, as contrasted with the diversity of types in the second generation, and for the facts of heredity in general, including Mendelian inheritance as a particular case.

Naudin was led to enunciate his principles from a consideration of the results obtained with the hybrids *Datura Stramonio-laevis*, *Linaria purpureo-vulgaris*, *Mirabilis longiflora-Jalapa*, and the writer adds his observations on these plants, and more especially a detailed account of his work on the barleys (*Hordeum distichum nutans*  $\times$  *H. distichum erectum*; *H. distichum*  $\times$  *H. tetrastichum*; *H. distichum nutans*  $\times$  *H. distichum nudum*) and *Pyrus Bellveriana* (sterile hybrid between *Pyrus* and *Sorbus*), which is all confirmatory. He shows, moreover, that the so-called sexual hybrids *Cytisus Adami*, *Crataegomespilus Dardari* and *Assieresii*, the Orange trees *Bizarria*, the almond-peach tree, etc., whose origin is uncertain, could be explained on the same hypothesis, and lastly that the vegetable chimeras of Winkler (1), Daniel's graft hybrids, and Baur's *Pelargonium zonale* all fall into line.

The writer contributes a considerable number of fresh observations on *Cytisus Adami*, and suggests that the name of *Naudinian heredity* should be adopted for this old hypothesis which he has revived.

659 — **The Bearing of Teratological Development in Nicotiana on Theories of Heredity.** — WHITE, O. E. in *The American Naturalist*, Vol. XLVII, No. 556, pp. 206-228. Lancaster, Pa., April 1913.

Two strains of *Nicotiana Tabacum* were investigated, the one being a fasciated sport of the other. When crossed there resulted in F<sub>2</sub> a simple Mendelian ratio of 3 : 1 as regards normal and abnormal characters, and with a little practice the heterozygotes were distinguishable. The segregates bred true in the F<sub>3</sub> and F<sub>4</sub> generations.

The cytological examination of the plants showed that the abnormality is exhibited even in the germ cells, and the data as a whole raise a question as to the significance of chromosomes in inheritance.

- 660 - **Breeding of Vines.** — DERN: In *Mitteilungen des deutschen Weinbauvereins*, No. 12, 1912, summarized by DETZEL; in *Fühlings Landwirtschaftliche Zeitsung*, Year 62, Part 5, pp. 181-182 Stuttgart, March 1, 1913.

The writer advises the breeding of vines, not only for the purpose of increasing their productivity but also with a view to making them more resistant to diseases.

At the instigation of the writer, the Bavarian Government has established an Organization for vine breeding; a special official has been appointed for the work. The Society for the Promotion of Plant Breeding in Germany has also made a special section for vine breeding.

- 661 - **The Influence of the Environment on the Milling and Baking Qualities of Wheat in India: No. 2.** — HOWARD, A., LEAKE, H. M., and HOWARD, G. L. C. — *Memoirs of the Department of Agriculture in India*, Vol. V, No. 2, pp. 49-102. Calcutta, January 1913.

CEREAL AND  
PULSE CROPS

An account of the experiments of 1909-10 and 1910-11, a summary of which has already been published in the Annual Report of the Agricultural Research Institute of Pusa (1).

- 662 - **Soy Beans in India.** — WOODHOUSE, E. J. and SOMERS TAYLOR, C. The Varieties of Soy Beans found in Bengal, Bihar and Orissa, and their Commercial Possibilities. — *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. V, No. 8, pp. 103-175. Calcutta, March 1913.

At the present time soy beans are cultivated to a small extent in the Darjeeling Hills, and to no appreciable extent elsewhere in India, but during the years 1909-11 experiments were carried out in Bengal, Bihar and Orissa to ascertain the commercial possibilities of the crop in the plains.

Three definite types of beans have been isolated from native seed and studied. In two cases the oil content was found to be relatively high and the nitrogen content low, while in the other case the reverse occurred; these characteristics were inherited.

The yields obtained usually varied from 650 lbs. to 1 000 lbs. per acre, though under favourable circumstances they rose to 2 200 lbs. per acre; these yields compare favourably with those obtained in Manchuria. The cost of cultivation was estimated at 13s to 20s per acre, though it might rise to 27s per acre. Under these conditions, prices of £ 5 8s to £ 5 17s per ton are required to make the crop remunerative; for the present such prices are not to be obtained, £ 4 10s being offered by merchants in Calcutta. But there can be no doubt that the crop is intrinsically worth more than this, and signs are not wanting that its value as a food stuff is being appreciated, so that a considerable rise in prices is not unlikely.

The varieties used in the experiments occupied the land for two seasons in the plains and the crop had therefore to pay double rent. Efforts will now be concentrated on the production of new varieties combining the qualities of early maturity, productiveness, and high oil content, and if these attempts are successful, the projects of making the crop a remunerative one in India will be far more hopeful.

## ROOT CROPS

663 - The Sweet Potato and its Cultivation. — MATTEI, G. E. in *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo*, Vol. XI, Part 1-2-3, pp. 3-17. Palermo, January—September, 1912.

After giving some information respecting the origin and history of the sweet potato and a description of its biological characters, the writer deals with the cultivation and utilization of this tuber. He calls to mind the uncertainty which still exists as to the origin of this species, which has so far never been found wild in any part of the globe and has therefore been attributed by several botanists to different genera.

Choisy called it *Batatas edulis*, thus changing the name of *Convolvulus Batatas* given to the plant by Linnaeus and creating a new genus; now, the sweet potato is identified under the name of *Ipomoea Batatas* Poiré; it was considered by Asa Gray to be the cultivated form of *I. fastigiata*.

It has a number of popular names in America: "Ajes" in the West Indies, "Camotes" in Mexico, "Jatica" in Brazil, "Apichu" and "Sinet" in Peru. In Asia and Africa, the natives use names which cannot always be attributed with certainty to this plant alone; the most certain are "Dankali", "Kitaiti" and "Veezee", which are current in Central Africa.

The sweet potato requires an equable, sub-tropical climate; nevertheless it grows at high altitudes in temperate and nearly cold regions, such as Venetia in Italy, where it is extensively cultivated. The soil must be very thoroughly worked, but not too deep; it requires liberal supplies of potash, and green manures, farmyard manure, cotton cake, etc., should be given. It is multiplied by slips or "draws", the latter being the safer method. In both cases, the soil should be made into ridges 2 feet apart; on these the plants are placed in one line, at intervals of 1 foot.

In hot climates, the tubers attain their complete development three months after planting, while in Italy, even if they are placed in the ground at the most favourable date, the beginning of April, the crop cannot be dug until October. Under ordinary conditions and in temperate countries, the average yield is about 1 lb. per plant and 7 or 8 tons per acre.

The sweet potato is especially grown as an article of food and is much appreciated in hot countries; in Brazil, it is used for the preparation of an alcoholic beverage. The tubers contain from 15 to 30 per cent. of starch, which is easily extracted; this has lately been put on the market under the name of "Brazil Arrowroot". They also have 12 per cent. of sugar, but the latter is difficult to isolate owing to the presence of glucose. The very young stalks are eaten as a vegetable, the harder, stringy ones making good forage. The sweet potato is employed in the preparation of syrups, and its content of sugar only extracted with difficulty, together with its richness in starch, make it an excellent raw material for the alcohol industry.

- 664 - **Pasture Problems : Drought Resistance.** — STAPLEDON, R. G. (Agricultural Department, University College of Wales, Aberystwith) in *The Journal of Agricultural Science*, Vol. V, Part 2, pp. 129-151. Cambridge, March 1913.

FORAGE CROPS.  
MEADOWS  
AND PASTURES

The effect of the drought of 1911 on some pastures in the Cotswold district was studied by making quantitative and qualitative analyses of the herbage at various periods of the year, and observing the behaviour and power of resistance of a large number of its constituent species.

- 665 - **Teff (*Eragrostis abyssinica*).** (1) — BURTT-DAVY, J. in *The Agricultural Journal of the Union of South Africa*, Vol. V, No. 1, pp. 27-37. Pretoria, January 1913.

The writer, who introduced the cultivation of teff as a forage grass into the Transvaal in 1903, gives an account of its history in that country, and shows how slowly the crop came into favour in spite of favourable reports on trials made in Natal as far back as 1887. It has now proved itself a complete success and is fast becoming a staple hay crop throughout civilized Africa, its qualities being: palatability, high nutritive value, heavy yield, rapid growth, drought resistance, and ability to smother weeds. The experience of the Transvaal might well be repeated in India and Australia where preliminary trials proved satisfactory, but where the subsequent popularization has not yet occurred.

- 666 - **Russian Cotton.** — TARIS, E. in *L'Agriculture Pratique des Pays Chauds*, Year 13, No. 119, pp. 89-111. Paris, February 1913.

FIBRE CROPS

During the months of April to September 1912, a Commission was sent from the French Colonial Office to travel through Turkestan and Transcaucasia in order to make an enquiry into the general conditions of agriculture of those countries, more especially with regard to the cultivation of cotton, and the developments that are likely to take place in the production of that article. Starting from Poti and Batum on the Black Sea, the Commission travelled east through the entire tract of country as far as Kokand and the Ferghana Province, gathering information directly from agriculturists, and statistics from the Director of the Domain at Tashkent, the Committee of the Stock Exchange at Kokand, agricultural engineers in Turkestan, and the Director of Water Inspection in Transcaucasia.

I. *Turkestan* consists of two distinct regions: the one, in the North, an immense plain, arid and desert with the Ural Sea as a central depression; the other, in the South, mountainous and more fertile. The latter is traversed by two principal rivers, the Syr-Daria and the Amu-Daria, which are over 2 000 versts (1326 miles) long and on which the prosperity of the country chiefly depends; the province of Semirychensk (just South of the Lake of Balkash) is the only well watered district in the country. The climate is typically continental, *i. e.* subject to great extremes, and the average rainfall varies from 5.2 in. to 12.6 in., rising to 22.8 in. in the Province of Semirychensk.

The soil consists of a very thick layer of loess clay, which forms a fine yellow-white dust during the summer and dries with a very hard crust when

(1) See also No. 2107, B. July 1911.

(Ed.).

wetted, occasionally making germination very difficult. Needless to say, cultivation is only possible where irrigation is practised, and as the water supply is limited, the area under crops only represents 1.8 per cent. of the total area of the country and is restricted to the river valleys. However, with better management of the water supplies it would doubtless be possible to extend the cultivated area very largely, and were this accomplished, the annual rainfall might also increase gradually, for old traditions of the tenth century indicate that much of the country which is now a desert was at one time productive.

The crop distribution in 1909 was as follows :

	Acres	Per cent. of cultivated area
Wheat . . . . .	3 891 225	47.5
Rye . . . . .	80 589	1.0
Barley . . . . .	761 270	9.4
Oats . . . . .	379 138	4.6
Millet . . . . .	526 275	6.4
Maize . . . . .	392 966	4.8
Cotton . . . . .	798 026	9.7
Rice . . . . .	457 748	5.6
Peas . . . . .	45 433	0.6
Linseed . . . . .	134 084	1.6
Lucerne . . . . .	621 599	7.6
Others . . . . .	101 526	1.2

The area in cotton is small and unequally distributed amongst the provinces, Ferghana producing 111 080 tons out of a total of 176 600 tons. The cotton is ginned in Turkestan, where numerous factories exist, not only for ginning purposes, but also for dealing with the seed and its products. The lint is all exported to Russia, where it is woven into cloth and then reexported for the most part to the Turkestan markets. It is hoped, however, that this uneconomical state of affairs will not persist much longer and that cotton mills will shortly be established in Turkestan itself.

Difficulties of transport are immense in Turkestan and are a serious charge on the exported cotton. There exist two railway lines : one, the Orenburg-Tashkent which comes from the north, touches the Ural Sea, and then follows the Syr-Daria to Tashkent, and the other starting at Krasnovodsk on the Caspian Sea and running west to Andidjan (Ferghana). Freights to Moscow vary from £ 6 5s to £ 7 8s per ton, and to this must be added the cost of conveying the goods from the market to the railway line, which may amount to £ 6 16s per ton. High freights impede the development of cotton cultivation in yet another way, for they constrain every district to produce its own corn before turning its attention to other crops, and consequently those parts which are specially adapted to the growth of cotton cannot devote as large an area to it as they otherwise would.

The economic situation of the native cultivators too, is unsatisfactory, for they possess little knowledge of the cotton crop and insufficient capital ; many who have embarked on its cultivation have fallen into the hands of

usurers, getting more and more into debt every year. But, should steps be taken : 1) to relieve this situation by the organization of credit societies, 2) to improve transport, and 3) to create experimental stations for the guidance of the native cultivators, the profitable cultivation of cotton is capable of immense development, and having satisfied the demands of the Russian market, a large surplus of medium quality American Upland cotton could be put on the other European markets.

II. *Transcaucasia* is a far richer country than Turkestan, more densely populated, and more varied in every way. It is essentially mountainous, and besides mineral riches possesses a fertile soil, a good climate, and a sufficient rainfall. Vines, fruits, tobacco, tea, maize, cereals are all cultivated. The districts suitable to cotton are in the south-east, in the valleys of the Aras and the Kur, where the rainfall is smaller and irrigation can be practised. Cotton is a far less important crop in this country than in Turkestan. It has only been introduced about 10 years and plantations are not numerous, being still in the experimental stage. But it is safe to predict that Transcaucasia would easily produce as much cotton as is being produced in the whole of Turkestan to-day, and moreover its geographical position is far more favourable for reaching the European markets. For the present, however, no considerable output from that quarter is to be expected.

667 - **The Cotton Industry of Northern Nigeria.** — *Bulletin of the Imperial Institute*, Vol. XI, No. 1, pp. 70-79. London, January-March 1913.

"Cotton has long been cultivated by the natives of Northern Nigeria, and the markets of the more northern parts have been frequently visited by caravans from North Africa in order to obtain the cotton used in the weaving industry of that part of the continent. Hitherto transport difficulties have prevented the cotton of the northern districts being exported to the United Kingdom, but the completion of the Baro-Kano railway will enable this vast and populous area to be tapped. Up to the present the efforts to encourage cotton cultivation amongst the natives have been confined to the Niger and Benue valleys, and with this end in view the British Cotton Growing Association erected ginneries at Lokoja, at the junction of the Benue and Niger rivers, and at Ogudu on the Niger in the Ilorin province. More recently a large ginnery has been erected at Zaria, further north. The Ogudu ginnery, however, was closed on the opening of the Lagos Government Railway, the cotton from this district being ginned in Southern Nigeria."

"In the Kans and other northern districts, the indigenous cotton is short stapled with white lint, whilst that of the Benue and Niger valleys is long stapled with tinted lint. Plantations have been formed by the British Cotton Growing Association at Lokoja and Ogudu, where experimental work has been carried out on the acclimatisation of exotic seed, selection of native seed and varieties, rotation of crops, time of planting, comparative tests of varieties, cultivation by draught animals, etc. Exotic cottons have also been experimentally cultivated at some of the gaol farms."

"Complete statistics of the exports of cotton from Northern Nigeria are not available, but some idea of the production may be gained from the following figures, showing the quantity of unginned cotton purchased by the British Cotton Growing Association and by merchants in recent years : "

1904 . . . . .	156	1908 . . . . .	152
1905 . . . . .	} 362	1909 . . . . .	375
1906 . . . . .		1910 . . . . .	111
1907 . . . . .	368	1911 . . . . .	230

A collected report is given of the samples received for examination since 1909. Out of a total of 14 samples, 12 indigenous varieties and one improved American Upland were valued as approximately equal to the current price of "middling" American, while a second improved American Upland variety was valued at 9d per lb. with "middling" American at 6.60 d per lb.

668 - **Cotton in Egypt and the Anglo-Egyptian Sudan.** — SCHANZ, MORITZ in *Beihfte zum Tropenpflanzer*, Vol. 14, No. 1-2, pp. VII + 180. Berlin, February 1913.

In the above double number of the supplement to *Der Tropenpflanzer*, the writer gives a brief historical review of cotton cultivation in Egypt; he then deals with the natural and economic conditions of 1) Egyptian and Sudanese agriculture in general (soil, climate, irrigation, tillage, schools and associations, forms of tenure, credit systems); 2) the cultivation of cotton in both countries (especially: varieties of cotton, seed cotton and seed breeding, cotton growing, pests of the crop, profits, uses, and export and import of cotton).

## SUGAR CROPS

669 - **The Distance apart for Sugar Beets. Experiments in Hungary.** — JANCsó. BÉLA in *Mezőgazdasági Szemle*, Year XXXI, Part 4, pp. 192-194. Budapest, April 1913.

The high cost and bad conditions of labour in Hungary oblige farmers to have frequent recourse to the use of agricultural machines. In sugar-beet growing, horse-hoes are much employed and are very useful, not only because they do the work more cheaply than hand labour, but also because there is frequently a deficiency in labourers. It is obvious that the greater the distance between the rows, the more successfully horse-hoes work, even when in the charge of unskilled labourers. Hungarian farmers are beginning to find that the usual space of 14  $\frac{3}{4}$  ins. between the rows is not sufficient, and already some of them are trying to exceed it. The present question under discussion is whether, and how far, this limit can be safely exceeded in Hungary, without decreasing the quantity or quality of the crops.

In order to solve the problem, the Royal Hungarian Agricultural Station has made experiments on 13 estates according to the following plan :

TABLE I

Plots	Distances	
	between the rows. in.	between the plants in.
1 and 5	14 $\frac{3}{4}$	8 $\frac{1}{4}$
2 » 6	16 $\frac{3}{4}$	8 $\frac{1}{4}$
3 » 7	17 $\frac{3}{4}$	8 $\frac{1}{4}$
4 » 8	25	8 $\frac{1}{4}$
9 » 13	14 $\frac{3}{4}$	12 $\frac{3}{4}$
10 » 14	16 $\frac{3}{4}$	12 $\frac{3}{4}$
11 » 15	18 $\frac{3}{4}$	12 $\frac{3}{4}$
12 » 16	25	12 $\frac{3}{4}$

As is seen, the tests served for the comparison of four different distances between the rows and two between the plants. The minimum distances were taken as 14  $\frac{3}{4}$  by 8  $\frac{1}{4}$  in, these being the usual distances in Hungary.

TABLE II.

Names of estates	Experiment Plots							
	120 sq. in. 14 $\frac{3}{4}$ × 8 $\frac{1}{4}$	137 sq. in. 16 $\frac{3}{4}$ × 8 $\frac{1}{4}$	143 sq. in. 16 $\frac{3}{4}$ × 8 $\frac{1}{4}$	184 sq. in. 14 $\frac{3}{4}$ × 12 $\frac{3}{4}$	208 sq. in. 16 $\frac{3}{4}$ × 12 $\frac{3}{4}$	205 sq. in. 25 × 8 $\frac{1}{4}$	233 sq. in. 18 $\frac{3}{4}$ × 12 $\frac{3}{4}$	213 sq. in. 25 × 12 $\frac{3}{4}$
Pereszteg . . . . .	1	1	1	4	6	5	3	10
Szerencs . . . . .	1	1	1	7	8	1	8	7
Botfalva . . . . .	1	3	6	4	5	—	10	—
Nagytelek . . . . .	1	1	3	3	5	8	10	10
Dózság . . . . .	3	4	4	1	1	6	1	4
Galánta . . . . .	2	1	2	1	1	5	5	4
Gány . . . . .	2	1	1	1	2	3	2	4
Elecske . . . . .	3	1	5	6	8	5	10	6
Páld . . . . .	3	1	1	1	1	3	4	3
Réte . . . . .	1	1	1	1	2	3	4	5
Ispácz . . . . .	2	2	3	1	3	4	3	7
Ujhely . . . . .	1	1	2	1	1	3	1	3
Koszt . . . . .	3	1	2	1	1	1	3	2
Average . . .	1.84 2	1.46 1	2.46 3	2.46 3	3.38 4	3.61 6	4.92 7	5.00 8

Table II gives the average results of the experiment plots. The latter were numbered in the following manner: differences in the crop of less than 5 per cent. were not taken into consideration, but were noted down. Crops 5 per cent. below the maximum were numbered 1; those from 5 to 10 per cent. below, 2; those 10 to 15 per cent. below, 3, and so on.

The columns are arranged according to the increasing distances.

According to this table, the maximum crop was obtained with a distance of  $16\frac{3}{4} \times 8\frac{1}{4}$  in., while larger distances gave considerably lower crops. It is interesting to note that, with the same space between the rows, the yield was inversely proportionate to the distance between the plants in the rows. A distance between the rows of 25 in. caused a reduction in the crop, even when there was no drought. A slight increase in the distance had no bad effect on the sugar-beets, but if the space was further increased, the quality of the beets suffered in proportion. Finally, the experiment proved that with the distance of  $16\frac{3}{4} \times 8\frac{1}{4}$  in. a better crop can be obtained than with that of  $14\frac{3}{4} \times 8\frac{1}{4}$  in. which is usual at present in Hungary. Nevertheless, the writer is of opinion that the question of distance depends upon climatic conditions and upon the quality of the soil. Thus, in a district with more frequent rainfall and where the soil is richer in humus, the space of  $16\frac{3}{4}$  in. between the rows is too much, and beets grown under these conditions do not thrive so well.

He advises every farmer to make experiments to decide the best distance to be adopted in his special case.

670 - The Use of Commercial Salt as a Fertilizer for Sugar Beets in Hungary. — JANCsó, BELA in *Köztudok*, Year 23, No. 23, pp. 808-809. Budapest, March 22, 1913.

The wild form of the cultivated beet is *Beta maritima*, which is found growing in saline soil and in a salt-laden atmosphere on the coasts of Europe. This fact led experimenters to try whether mangolds and sugar beets took kindly to the application of kitchen salt as a manure. In order to test the effect of this fertilizer, the Royal Agricultural Station at Magyaróvár began a series of experiments in 1909, using however commercial salt instead of the kitchen article, as being less expensive. The experiments of 1909 and also those of 1911 showed that, under certain conditions, the beet reacts satisfactorily to the application of this substance, but that if the soil is too heavy, the salt easily gives rise to cracks, which hinder the development of the plant.

By order of the Ministry of Agriculture, these experiments were continued last year on the State Domains and at the Agricultural Schools. The writer summarizes the results of 23 experiments arranged in four groups:

I. Experiments on sugar beets on eight estates with heavy clay soil using 315 lbs. of commercial salt per acre. In four cases the salt increased the crop, in three it had no effect upon it, while in one the result of the application of the fertilizer was to reduce the yield.

II. Experiments at seven different places using 235 lbs. of commercial salt per acre. Here also the crops were increased in four cases. On the Mácsa State Stud farm at Gödöllő, on the contrary, the yield of the control plot exceeded that of the salted plot by 600 lbs.; but owing to the drought prevailing during August and September, the heavy clay soil of this estate only yielded a very poor crop.

III. Four experiments using 160 lbs. of salt per acre; of these two gave good results; in the case of the others, which were on loose sandy soil, the salt had no effect.

IV. Experiments with different amounts of salt. The results obtained show that, in order to increase the beet crop, at least 160 lbs. of salt per acre must be applied; if the amount is raised to 320 lbs. its action is more efficacious. On the Fogaras State Stud farm the fertilizer was applied in the rows. This experiment showed that 160 lbs. of commercial salt applied in this manner have a more noticeable effect than 320 lbs. broadcasted.

All these experiments therefore show that this inexpensive compound can, under certain conditions, increase the sugar beet crops, but it must be used with caution where the soil is heavy.

671 - **The Date Sugar Industry in Bengal.** — ANNETT, H. E. in *Memoirs of the Department of Agriculture in India*, Vol. II, No. 6, pp. 282-389. Calcutta, March 1913.

Out of a total of 3 000 000 tons of raw sugar or 'gur' produced annually in India, at least one-tenth, or 300 000 tons, and probably more, is produced from palms, so that the industry is still a considerable one, though it seems to have declined somewhat of late years in favour of imported products from Java. Bengal accounts for about a quarter of the total produce, and the writer made an extensive study of the agriculture of the date palm (*Phoenix sylvestris*) in the Jessore District, including methods of cultivation and tapping, and of the manufacture of raw and refined sugars.

The yield per tree varied considerably both with individuals and with plantations, but 170 lbs. of juice may be taken as an average yield per tree throughout the date sugar districts; this estimate is considerably lower than any which have been made previously. On boiling down, 170 lbs. of juice forms 21  $\frac{1}{4}$  lbs. of gur, and with 240 trees to the acre, 2.3 tons of gur may be obtained per acre, a higher yield than can be obtained from cane in the same districts.

The raw juice contains 8 to 14 per cent. of sucrose, associated with practically no glucose; but, owing to imperfect methods of collection, 1 to 2 per cent. of glucose is formed during the process. The boiling is carried out in small earthenware pots, and results in a loss which may amount to 20 per cent. of the sucrose, while the refining processes cause further wastage. Each cultivator possesses his own primitive boiling plant, and the gur is the staple marketable commodity. Large quantities are consumed locally, and the surplus is sold to middlemen who either transport it to more distant parts for direct consumption, or sell it to native refineries. Calcutta is the chief market, and large quantities are there made into

sweatmeats. The refined sugars are mainly consumed by the richer classes of natives, and the molasses are used for making rum and for mixing with tobacco.

Simple and inexpensive reforms are suggested by the writer, more especially with regard to the tapping, but also in the boiling and refining processes. These should effect great improvements. Judging from the success obtained by improved methods employed in the Maple Sugar Industry in America, where a juice containing only 3 per cent. of sucrose is exploited, a little expenditure of capital in the date sugar industry in India would yield ample returns.

## OIL CROPS

672 - **The Recent Evolution of the Exploitation and the Industry connected with the Oil Palm.** — BRÉT, M. C. in *Journal d'Agriculture Tropicale*, Year 13, No. 140, pp. 42-47. Paris, February 28, 1913.

The exploitation of the oil palm has, under European guidance, evolved from a home industry into an important commercial undertaking. The origin of this movement is to be sought in the reputation enjoyed by certain districts for possessing oil palms (*Elaeis*) which might be from 10 to 30 times more reproductive than they actually are at present.

The native palm groves receive no care, and the method of their exploitation leaves much to be desired; often the stands spring up after forest lands have been cleared, and their ownership is doubtful; sometimes the groves remain unexploited on account of the small number of the inhabitants. In order to prevent this loss, the Governor of the Ivory Coast first tried to induce immigration into the thinly populated rich districts from those which were poor and densely populated, but the practical difficulties entailed prevented the scheme being extended to other districts. It has been attempted with some measure of success to render the exploitation more intense by distributing among the natives little machines for crushing the nuts and thereby extracting more oil. The conditions obtaining prove the possibility of European industrial exploitation, but this could only exist in stands which are sufficiently extensive and rich to provide work for a factory, so that districts must be selected in which the biological conditions are the most favourable.

An attempt has been made to co-operate with the native workers by obtaining the sole right in certain zones of treating the fruit mechanically, thus forcing the former to sell their produce to the factories. This method, which is at variance with the usages of the natives, has not proved wholly successful. Installations based on this arrangement exist in the Kamerun and in Southern Nigeria; they are instituted by special legislation on the Ivory Coast and the Gold Coast.

The purchase from the natives of land bearing palm trees is a matter of great difficulty owing to the possession in common and various legal and administrative hindrances. Fairly remunerative contracts have been drawn up on the Ivory Coast by which the right of gathering the nuts has been ceded for a certain period of time.

Success can only be obtained by companies possessing capital sufficient to tide over the difficulties which are inevitable at first. According to the writer, success lies in the direction of systematic planting and the subsequent establishment of factories.

673 - **The Cultivation of Rubber Trees in West Africa.** — CHEVALIER, AUGUSTE in *Journal d'Agriculture Tropicale*, Year 13, No. 140, pp. 33-37. Paris, February 28, 1913.

The writer publishes some notes respecting the cultivation of different rubber-producing trees in West Africa and lays stress on the fact that the annual output of rubber in Tropical Africa has remained stationary for some years, so that it is high time that energetic measures were taken to make plantations.

After reviewing the results obtained in the different regions of West Africa with *Manihot Glaziovii* and giving the data collected regarding the yield from tapping, the distances between the trees, and the selection of seed, he recognizes the fact that the value of this tree for plantations in West Africa has not yet been determined. He suggests that all the trials should be made again, using seed from improved trees grown in German East Africa, since this colony possesses trees whose yield is well above the average and which can be tapped from two-and-a-half years, yielding throughout most of the year.

674 - **Method of obtaining Tall-Growing Trees of *Manihot Glaziovii*.** — ZIMMERMANN, A. in *Der Pflanser*, Year IX, No. 1, pp. 16-18. Darussalam, January 1913.

The writer has made a number of experiments, both at Amani and in other plantations, for the purpose of ascertaining the best methods of inducing height in such plants of *Manihot Glaziovii*, as, by reason of unfavourable climatic conditions or other undetermined causes, flower too early and thus ramify at an insufficient distance from the ground.

The following are the results of one of the experiments made at Amani:

The trees used had been planted in April 1911 and had mostly branched very low down. In September 1911, they were pruned in three different ways: 1) topped at 12 to 16 in. from the ground; 2) topped immediately below the lowest bifurcation; 3) at each point of ramification all the branches were removed, except the one nearest the stem; a month later the fresh shoots were treated in the same way. A fourth lot consisted of plants raised in the nursery and planted out in September 1911 in the place of dead trees, or such as were not growing well.

It was found that the trees of the third group, which had grown zigzag as a result of the pruning, never became straight, although they were young and the side shoots were constantly cut off. Further, the terminal shoots at once flowered again and gave rise to new ramifications. Thus, by this means no perceptible increase in the length of the stem is obtained. In the case of the trees of the second lot, new shoots at once made their appearance: these were all removed except the most vigorous, which grew in perfect line with the stem, in such a manner that the point of junction

became less and less perceptible. These trees began to branch again much more rapidly than those of the first lot, of which the stems were the highest of these three groups (averaging respectively 5 ft. 6 in., 3 ft. and 4 ft.).

The results obtained with the fourth lot were slightly more satisfactory; under the influence of favourable climatic conditions, these produced very tall stems (5 ft. 8 in.). The average circumference at 3 ft. in the four lots was  $8\frac{1}{4}$ , 10, 10 and  $7\frac{1}{2}$  in. respectively.

In conclusion the method most to be recommended is the topping of the stem at 12 or 16 inches from the ground, which should be done as soon as the first branching begins.

VARIOUS  
CROPS

675 - **The Results of Szeged Tobacco Selection in Hungary.** — SZÉKÁCS, ELEMÉR in *Magyar Dohánynyés*, Year XXX, Nos. 6 and 7, pp. 2-4 and 2-3. Budapest, March 20 and April 5, 1913.

It is more difficult to select tobacco by the pedigree system than it is to select cereals by the same method, for in the case of the latter, the seeds themselves are the commercial product and can be compared with the best varieties, while with tobacco it is the leaves which are the object of selection. As the leaves of the plants grown for seed production lose all their substance it is only possible to decide from the leaves of the second generation whether the parent plants had been well chosen and were suitable for reproduction. In order to shorten this long process, the writer at the time of the first selection experiment with Szeged tobacco in 1899, tried the following method: he removed all the flowers from the parent plants, except the top one which is the first to open. In this way, the plant does not exhaust itself in seed development but some of the sap is left for the use of the leaves, which retain their good quality and can be judged on the parent stem.

This experiment was successful: The parent plants ripened their single seed capsule completely; the leaves were gathered when mature, dried and sorted plant by plant, and valued before being made up into bundles. It was at once possible to observe among the leaves the greatest differences in form, size, colour, weight, texture, elasticity and combustibility.

In 1910, when the estate of Arpadhalom was entrusted, under the direction of the writer, with the cultivation of Szeged tobacco for the district of Békéscsaba, the experiments were resumed. In addition to the unselected seed chosen by the Government, he took the 25 parent plants of which the leaves best showed the characteristic qualities of Szeged tobacco. After proceeding in the manner described above he sent the leaves of each stem, made up in different bundles, to the Royal Experiment Station of Tobacco Cultivation at Debreczen, where they were submitted to chemical analysis. After minute analysis, 5 of the 25 parent plants were pronounced suitable for propagation. In 1912, these 5 pedigree families produced sufficient seed to sow about  $4\frac{1}{2}$  acres, so that in 1913, all the growers of the Békéscsaba district were able to grow exclusively pedigree tobacco. Further, 5 "métayer" tenants on the estate planted on their land plants belong-

ing to the same 5 pedigree families; each cultivated a separate family in the yield.

The writer gives a very detailed table showing the results obtained with pedigree and with unselected tobacco; the different columns give the areas sown, the yield of leaves and their classification, the average gross return and the returns per acre.

	Selected families	Unselected tobacco	Excess due to selection
Average yield per acre . . . .	1632 lbs.	1569 lbs	63 lbs.
Gross return per acre (sale price). .	£16-13-0	£15-1-8	£1-11-4
Average sale price per lb. . . .	2.45 <i>d</i>	2.31 <i>d</i>	0.14 <i>d</i>

M. Marton Liebhart, who is attached to the Station, established that the individual characters of each family were most striking, and that selected plants infallibly transmitted their physical characteristics. It, however, the crop was less than had been hoped, this was due partly to a bad autumn, and partly to the tenants, who were not of one mind with the cultivators, and their carelessness and obstinacy had an unfortunate result on the crops. In order to encourage emulation and to induce the tenants to work more harmoniously with the cultivators, the writer suggests that annual prizes should be given by the Tobacco Departement to those tenants who obtain the best results. Nevertheless, those hitherto obtained are sufficient to show that a great impetus has been given to tobacco growing in Hungary, thanks to pedigree selection.

The writer proposes to continue the minute comparison of the five families already existing and to improve other selected types, in order to obtain other pedigree families.

**676 - Experiments on Growing Coffee under Shade.** — BERTONI, MOISÉS S. Experimentos sobre la Resistencia del Café á la Maleza y su Crecimiento á la sombra de Árboles. Primera Serie: de 1909 a 1912. — *Agronomía, Boletín de la Estación Agronomica de Puerto Bertoni*, Vol. V, No. 3-4, pp. 119-128. Puerto Bertoni, Paraguay, January and February 1913.

This bulletin gives a preliminary report on a series of experiments carried out from 1909 to 1912.

The writer, having observed that coffee plants grow very well in company with all wild plants, except Gramineae and Compositae, set himself the task of ascertaining whether, by taking advantage of this fact, it would be possible to save the expense entailed by hoeing. To this end, he planted one-year coffees among the trees of a thinned virgin forest. He made four plots, which were hoed 1 to 4 times respectively in the year, and in each of which there were plants with much, little, and hardly any, shade. The experiment showed that those plots succeeded best which were only hoed once or twice (provided there were not many grasses or composites present).

This was the case under the conditions prevailing in Paraguay, *i. e.* with an annual rainfall of from 1500 to 2500 mm. (60 to 100 in.) and 70 to 80 actinometric degrees as the absolute annual maximum.

The writer concludes that in Paraguay shade is indispensable to coffee plantations (though he allows that elsewhere a herbaceous intercalary crop giving no shade might be the best). The depth of the shades should depend on the number of hoeings, but the protection is most necessary even if the plot is only hoed once. Shade is requisite for coffee trees of all ages; it is doubtful whether Leguminosae always afford the best protection; the writer obtained the best results with species of *Guarea* (Meliaceae) about 10 ft. high and the worst with *Lippia virgata* (Verbenaceae), or "Niño-rupá", about 6 ft. 6 in in height.

677 - **Pepper Production and Trade in Siam.** — *Ministère des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 63, pp. 77-79, Melun, March 1913.

Only two kinds of commercial pepper are recognized in Siam: — white and black. Nevertheless, of late years it has become the habit in some provinces to distinguish four qualities of black pepper; the first consists of only perfect seeds, round and full, and the fourth of small or broken seeds and fragments, the second and third being intermediate. The following table gives the average price of pepper at the place of production for the year 1911-1912.

	ticals per picul	pence per lb.
White pepper . . . . .	56	7 <sup>3</sup> / <sub>4</sub>
Black pepper: 1st quality . . .	36	5
"    "    2nd    "    . . .	32	4 <sup>1</sup> / <sub>2</sub>
"    "    3rd    "    . . .	23	3 <sup>1</sup> / <sub>4</sub>
"    "    4th    "    . . .	13	1 <sup>3</sup> / <sub>4</sub>

The tax on transit in the interior is 1.25 tical per picul (about 1 <sup>3</sup>/<sub>4</sub> d per 10 lbs.) in the case of white pepper, and 1 tical per picul (1 <sup>1</sup>/<sub>2</sub> d per 10 lbs.) for black. In 1911-1912 (the Siamese year begins on the first of April) the total export of pepper from Siam was 34270 piculs (4 569 300 lbs), worth 1 193 297 ticals (£ 919 933). The port of Bangkok exported 24 200 piculs (3 226 700 lbs.), worth 921 174 ticals (£ 710 072), while Phuket exported 10003 piculs (133 700 lbs), worth 271 827 ticals (£ 209 544). The chief buyers of Siamese pepper are England (13093 piculs = 1 754 700 lbs. in 1911-1912) and the United States (2291 piculs = 305 460 lbs. in 1911-1912). During the same year, 4677 piculs (623 500 lbs.) were sent to Singapore and 2367 piculs (315 600 lbs) to Hong Kong.

678 - **Experiment Field for Strawberries at Rétfalu, Hungary.** — *HEGEDŰS, ALADÁR in Mezőgazdasági Szemle*, Year XXXI, No. 4, pp. 186-188, Budapest, April 1913.

In the wooded mountainous country of the commune of Rétfalu (Sopron County), fruit growing has for many years been the principal source of revenue of the inhabitants. In the last 15 years, however, such an impetus has been given to strawberry growing that 250 to 300 tons of this fruit, worth over £10 000, are sent annually to the Vienna market. This remarkable result has caused the Ministry of Agriculture to take every possible measure to still further increase strawberry cultivation, especially by improving the quality and introducing varieties which can supply the

market from the commencement of spring to the end of autumn. The Ministry decided to lay out an experiment field for the purpose of spreading practical knowledge respecting improved methods of cultivation and for the acclimatisation of different varieties of strawberries and the distribution of proved kinds to growers.

The preliminary operations began towards the end of 1911. On March 1, 1912, an area of nearly 3 acres was rented for ten years on the entailed estate of Prince Eszterhazy. From that date, the necessary work for the preparation and irrigation of the soil has been in progress. In order to ensure a sufficient water supply eight reservoirs have been made into which pipes take the water direct from the ducal domain. A shed has been built by the Ministry of Agriculture to serve as a dépôt and also a packing and tool shed.

The experiment field is divided into three lots, each containing 800 beds of strawberries. In order to propagate intensive and systematic strawberry cultivation, a course of three half-years (middle of March to middle of October) has been arranged; the programme of instruction is as follows:

Year I: Preparation and working of the soil, and planting; gathering and packing the fruit.

Year II: In addition to the above work, the artificial multiplication and selection of varieties which suit the climate; the preparation and storing of seed.

Year III: Especially the control of strawberry pests and the testing of various remedies.

The experiment field has been in full working order for nearly a year. The writer intends to carefully follow the different stages of the undertaking and to make known the progress of the work, which is expected to prove most satisfactory.

679 - **Varieties of Water-Cress.** — LESOURD, F. in *Revue Horticole*, Year 85, No. 7, pp. 164-165. Paris, April 1, 1913.

In industrial water-cress beds which supply large towns, the wild species (*Radicula Nasturtium-aquaticum*) is not grown, as it is not sufficiently productive. From seed and by selection, stronger, more productive varieties have been obtained, differing from the wild type in the luxuriance of their foliage and the form of their leaflets. The four following varieties are the most remunerative: Billet cress (old variety), 7 leaflets; Boulanger, 5 leaflets; Chéron, 3 leaflets; Billet (new variety), 3 leaflets.

680 - **Capsicums.** — FOUSSAT, J. in *Revue Horticole*, Year 85, No. 7, pp. 164-165. Paris, April 1, 1913.

The writer deals with the cultivation of capsicums in France, which is effected either in frames, or else in the open in the South and in very sheltered spots.

In the North, the very hot-flavoured kinds are chiefly grown, e. g. the long, common, red capsicums used as condiments. In the South are grown the following varieties, which are much milder, and under various forms, both cooked and raw, form a part of the daily food of the people: Large

Mild Square, Spanish Mild Square, Early Yellow Square, and American Mild Square.

FRUIT-GROWING 681 - **The Summer Transplanting of Grafted Vines.** — LE JEAUX, JEAN in *La Vie à la Campagne*, Vol. XIII, No 157, pp. 210-212—fig. Paris, April 1, 1913.

The writer gives an account of a transplanting method adopted by a Russian, M. Tutrumov in the case of grafted vines in Bessarabia. The latter was of opinion that vines could well be transplanted in July or August of the same year in which they were grafted. The grafts would then begin to grow in their new position in the autumn and continue in the following spring. In order to carry out the summer transplanting, M. Tutrumov had a sheet-iron cylinder made 13 inches high and 9 inches wide; a strengthening ring was fixed at the top and a handle attached to the cylinder, as for a bucket; the cylinder is open at the bottom. This cylinder is driven into the soil round a vine, the soil being moistened and a narrow spade being used to help; when it is level with the surface, the enclosed soil and vine can be lifted by simply moving the cylinder from side to side a little and then drawing it out. These cylinders can be carried as they are if the soil is firm, but if it is loose a false bottom must be hooked on. For replanting, the cylinder is sunk in a hole and the soil pressed well round it: the earth inside is then watered and cut away from the walls with a knife, after which the cylinder can be drawn out.

M. Tutrumov finds this method always successful; the vines outstrip others of the same age, but not moved till the following spring, to such an extent that they might have been transplanted a full year earlier.

The writer remarks that, though this method may be too lengthy for planting on a large scale, it is well worth trying for gapping up; but the vines should be planted perfectly upright in the nurseries, as otherwise the roots would be cut off when the cylinder is forced into the ground.

682 - **The Koshû Vine.** — ONONE, J. in *Revue Horticole*, Year 85, No. 8, pp. 185-186 Paris, April 16, 1913.

Japan, on account of its excessively damp summers, is a very unsatisfactory country for vine cultivation; nevertheless some varieties of vine are grown there, one of which, called Koshû and belonging to the species *Vitis vinifera*, is much prized.

This vine is vigorous and has rather thick, fleshy roots which cannot resist phylloxera. There are two varieties: improved Koshû and Marunni Koshû (*i. e.* with round grapes). It resists chlorosis well, and is almost a climber as its stem is weak; the bark is thick. Buds simple or compound, very large, wide at the base, but not very pointed; young leaves rather thick, with five shallow lobes, hairless and smooth on both surfaces; veins green, and teeth very acute.

In Tokio, this vine flowers early in June. The branches are ramified; the young herbaceous shoots are of a reddish green. The grapes colour at the end of August and are ripe early in October; the fruit is reddish white and the plant fairly prolific. The leaves are wide, not long, five-lobed, delicate, not very resistant to cold, distinctly toothed; the upper surface

is of a fine green somewhat inclined to yellow, and fairly shining. The leaves turn colour late in the season and take a yellow tint.

*Fruit.* — There are two bunches on the shoot; the bunches are very large, the shoulders being long and well developed. The fruit is of good quality and in great demand for dessert; it is, however, also used for wine making.

683 — **A New Hybrid Direct Bearer.** — AURIOL, A. in *Journal d'Agriculture Pratique*, Year 77, Vol. I, No. 16, pp. 497-498. Paris, April 17, 1913.

The « Madone », a new vine from the department of Aude, has always shown itself resistant to mildew, powdery mildew and rots. The parent stem, which is sixteen years old, has yielded grafts for the last six years.

This hybrid, like the Durief and Chasselas, is an early variety and is therefore suitable for planting in the vineyards of Eastern, Northern and Central France. It shoots late, blossoms soon and ripens early; further it is suitable for growing on calcareous soil. Each shoot bears usually four bunches. As it is very vigorous and requires long pruning, it gives heavy crops. If there is frost, the eyes and resting buds produce fruit-bearing shoots with 2 to 4 bunches to the eye; and thus the crop is assured. The grapes which are shaded ripen as quickly as those exposed to the sun; this is an advantage in districts where the light is weak. The wine is bright red in colour; its alcoholic strength is from 11 to 12 degrees. The flavour is good and somewhat resembles that of the Hermitage wines.

This vine thus combines a number of qualities, which place it in the first rank of the direct bearers available for vine-growers who wish for an inexpensive crop.

684 — **Wines from Hybrid Vines at the Toulouse Exhibition.** — PLE-LABY, E. in *La Vie agricole et rurale*, Year 2, No. 19, pp. 543-547. Paris, April 12, 1913.

Already for some years, the Central Syndicate of Haute-Garonne, in cooperation with the various agricultural associations of the district, has organized an exhibition of wine made from hybrid vines. At these exhibitions, the samples presented are tasted, and as it is impossible to speak of the merits of a wine without discussing the qualities of the hybrid which produces it, a public meeting is held after the tasting, at which any person interested may give his opinion as to the cultural value of the hybrid.

The writer mentions the hybrids which have given the best results and records a perceptible improvement in the wines made from them; this allows of their increased cultivation being predicted.

685 — **The Grafting and Exportation of Green Tunisian Table Olives.** — MARZAC, F. in *Bulletin de la Direction Générale de l'Agriculture, du Commerce et de la Colonisation*, Year 16, No. 65, pp. 250-251. Tunis, Fourth Quarter, 1912.

In continuation of his previous investigations (1), which resulted in the discovery of a dozen varieties of olives suitable for preserving, the writer turned his attention to finding out which of these were the best sorts for export. The Bidh variety alone possesses the necessary qualities for this

(1) See B. Nov 1910, p. 86.

(Ed.).

purpose. Barouri is a fine large fruit, but its flesh is coarse and its stone large, rough, and furrowed, the skin is thick, and the fruit not suitable for pickling. The other varieties are only suitable for local consumption. Bidh el Hamman is often as large as Barouri; its shape is similar to the Spanish Gordale, and its flesh is fine in texture and well-flavoured and contains a relatively small stone; this fruit fulfils all the requirements for export. The writer advises the use of this olive for grafting. Olive-growers will find it much superior to the varieties grown for oil making, both as regards its yield and the high price fetched by the fruit.

686 - **Grafting Pears.** — PASSY, P. in *La Vie agricole et rurale*, Year 2, No. 17, pp. 474-475. Paris, March 29, 1913.

The stocks upon which the pear can be grafted are numerous, viz. seedling pear, quince, hawthorn, different species of *Sorbus*, and (in Algeria) Japanese Medlar or *Eriobotrya*. In France, only seedling pear and quince are commonly used.

For standard trees which are not to be pruned, but allowed to develop naturally, and will have to resist winds and the attacks of animals, the seedling pear must always be used as stock, no matter what kind of soil is to be planted. By this means, robust trees of large dimensions are obtained, capable of producing very heavy crops after a good many years. If on the contrary, small trees are desired, which are to be pruned regularly, and the surplus crop annually suppressed, then the quince is the best stock to choose.

687 - **On the Cultivation of the Date Palm for Fruit in Sicily.** — BORZI, A. in *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo*, Year XI, Part 1-2-3 (January-September), pp. 44-60. Palermo, 1913.

The cultivation of date palms with a view to obtaining eatable ripe fruit can be successfully undertaken in Sicily, and especially in the most southern portions of the island, under the following conditions:

1). Early ripening varieties must be introduced and grown. These require less heat for ripening their fruit than the inferior kinds, and therefore are more sure to become acclimatized. The common varieties, indeed, need a minimum of 5100° C., while 4080° C. are sufficient for the early kinds. It would therefore not be difficult to grow certain varieties in Sicily, where the sum total of the temperature varies between 3650° C. and 3800° C. The same result can be obtained by cultivating very late varieties, which are capable of enduring low winter temperatures without the loss of their already-formed fruits. The latter would ripen at the end of the spring, or during the summer of the following year. This method would also have the advantage of supplying dates before the African fruit was on the market.

2). Another plan would be to grow *Phoenix melanocarpa* Naudin, care being taken to prevent the propagation of this species by seed. The fruit of this date palm is black and if not at once a favourite for table purposes, its excellence would soon ensure its sale, especially as it would appear on the market in the early summer. It is perhaps well to add that this

type of date palm is well adapted to the milder climate of other Mediterranean districts.

3). It is necessary to try and obtain, by hybridization and selection, species or varieties which are capable of being thoroughly acclimatized to Sicily. For this purpose, advantage can be taken of the extraordinary capacity for variation possessed by the date-palm (hundreds of cultivated varieties being known), and of the facility with which crosses can be made between all species of the genus *Phoenix*. *Ph. canariensis* would be a good species for the creation of hybrids, since this tree extends beyond the hot arid zone of *Ph. dactylifera* and grows in latitudes where the temperature descends at times below 10° C. Further the fact that the Canary Date Palm is capable of propagation when often only 8 or 10 years old, at least in the climate of Sicily, would greatly facilitate the solution of the problem.

688 - A Wind-break tested in Libya. — *Bollettino del R. Orto Botanico e Giardini Coloniale di Palermo*, Year XI, Part 1-2-3 (January-September), pp. 37-39. Palermo, 1912.

*Myoporum serratum*, which about thirty years ago was pointed out by Barzi as a suitable plant for arid and sandy soils and which was recently recommended by Fiori for the fixation of dunes and by Bruttini (1) as a wind-break in Libya, has been successfully tested at Bucamez (Western Tripoli), where it thrives on sand infiltrated with brackish water, showing perfect resistance to the unfavourable conditions of climate and of soil. At present they are the only green plants existing on that shore.

689 - Forestry in China. — MONTAGUE, H. T. and WOODHEAD, H. G. W. *The China Year Book 1913*, passim London

FORESTRY

Deforestation has played an active part on the surface of China, with the result that large forests in China proper are rare. They are met with, however, in certain districts of Central Asia, in S. E. Tibet and in Mongolia and Manchuria. In Eastern Turkestan are to be found birch, pine, fir, spruce, larch, and poplar, while in the less favoured districts artemisia and tamarisks relieve the stretches of reeds and coarse grass that cover the steppes. In S. E. Tibet may be seen juniper, willow, pines, firs, cedars, elms and a large species of holly; while in the sheltered valleys grow wheat, barley, rice, fruit trees and vegetables. The medicinal rhubarb-tree is also a native of these plateaux. The tree grows to a height of eight or ten feet and the rhubarb of commerce is its root, dug up early in spring, cut into long flat pieces and dried. Dwarf elms and willows are met with in the Gobi Desert. In northern Mongolia and Manchuria the same trees reappear, together with oak and walnut.

Chinese timbers include pine, fir, maple, ebony, oak, camphor, teak, mahogany, birch, plane, elm. In this category may be mentioned the bamboo, which looms so largely in the everyday life of the Chinese. With it they build houses and erect temporary shelters: it is used for

(1) See No. 1429, B. Oct. 1912.

(Ed.).

allscaffolding purposes, and for the transport of all goods by human agency. In early life it is used for food; when full grown it supplies the vast water population with masts, and from it are made chopsticks, pipes, umbrellas, tables, stools and musical instruments. Between forty and sixty varieties of bamboo are said to be known to the Chinese.

Among other trees worthy of mention are the varnish tree (*Rhus vernicifera* D. C.), the tallow tree (*Stillingia sebifera* Michx.), wood-oil tree (*Aleurites cordata* Stend.), and vegetable wax tree (*Fraxinus chinensis* Roxb.).

Twelve species of rhododendron are met with in Szechuan, where rhododendron forests are found at altitudes ranging from 2000 to 12 000 ft.

China has to import timber to satisfy its own needs, nearly as much wood entering China from abroad (£ 539 730 worth in 1911) as is obtained within its borders for purposes of local trade through the Customs (in 1910 £ 641 969). Foochow poles (fir and pine) are the chief feature of the industry. The forests are owned by private individuals, and timber is felled all the year round, while replanting is only done spasmodically. In this respect Fukien province resembles the rest of China. The main supply of timber has hitherto come from twenty-three districts in the prefectures of Yenping, Kienning, Shaowu, and Tingchow. The poles, using various streams, collect at Nantai, where in the aggregate they reach an annual value of £1 000 000. Hankow in 1910 for the first time surpassed Foochow as the chief port of the trade, with Antung, the port of export for Manchurian timber brought from the Yalu, and Kowloon next in order. The timber trade of Wuchow (Kuangsi), mainly in junks, is however estimated at £250 000. The output of the Yalu Timber Company for 1910 is given as 800 000 logs of 8 feet long. A dividend amounting to £150 000 was paid, equivalent to 5 per cent. on the original capital.

Examples of afforestation are being set by the Chinese in the Hong-kong leased territory at Weihaiwei, in the German territory of Kiaochow, and by the Chinese Engineering and Mining Company at Tongshan, Chihli. Little attempt has been made by the Chinese to profit by these examples, but a writer in a recent *Bulletin* of the Royal Botanic Gardens, Kew, mentions that among the hill men or Hakkas of Kuangtung province the practice of forming plantations, mostly of pines, on the hills round their villages is becoming general; but they have not developed a sound principle of forestry and therefore obtain only a scanty return for the labour expended upon it. It is indeed quite a rare thing to see any trees planted by the Chinese permitted to attain their proper development for market purposes.

The State Forest administration is attached to the Ministry of Agriculture and Forestry (Nung Ling Pu). The following official system was promulgated on August 8, 1912.

The Minister of Agriculture and Forestry has control over all matters regarding agriculture, irrigation, forestry, the breeding of

domestic animals, sericulture, pisciculture, reclamation of waste lands, and of all yamens established therefor, and officials connected therewith.

The General Office of the Ministry, besides fulfilling the duties provided for under the General Rules common to all Ministries, shall undertake the following:

- a) All matters concerning Forestry and Agriculture.
- b) Agricultural and Forestry Exhibitions and Conferences.
- c) Investigations abroad in connexion with Agriculture and

Forestry.

The Ministry shall contain the following Departments:

- a) General Agricultural Affairs.
- b) Reclamation.
- c) Forestry.
- d) Fisheries and Marine Products.

The Forestry Department shall supervise the following:

- a) Encouragement and supervision of afforestation.
- b) Conservation of forest.
- c) Government forests.
- d) Organization of forestry enterprises and control of same.
- f) Other matters relating to forestry.

690 - A New Method for the Afforestation of the Sandy Portions of the Great Hungarian Plain (Alföld). — KISS, FERENCZ (Chief Counsellor of the Department of Water and Forests) in *Erdészeti Lapok*, Year LII, Part VII, pp. 296-318. Budapest, April 1, 1913.

The report presented on March 14, 1913, to the National Forestry Society and dealing with the afforestation of the sandy parts of the Great Hungarian Plain. This afforestation was intended at the beginning to protect the neighbouring pastures and cultivated land from the encroachment of the moving sands of the adjacent steppes. The work was begun 100 years ago, and its economic utility was only considered after the continued labours of a century had unexpectedly been crowned with success. At first, black poplars were planted, and it was only in 1870 that *Robinia* took exclusive possession of the wooded portions of the Alföld. The writer gives a biological study of the flora of the Great Hungarian Plain, including *Robinia*, which tree, in his opinion, is not capable of improving the poor soil. He recommends a new method, which does not confine itself to the afforestation of land suitable for tree plantations, but extends to the reclamation and improvement of a large portion consisting of sandy soil and sandhills, which hitherto has been little used owing to the poverty and dryness of the land. The writer attests the excellence of Austrian pine for preliminary planting, as it renders the soil suitable for the cultivation of more remunerative forest trees.

## LIVE STOCK AND BREEDING.

## HYGIENE

691 - Oxidation of the Arsenite of Soda in Dipping Tanks. (1) — WILLIAMS, C. in *The Agricultural Journal of the Union of South Africa*, Vol. V, No 1, pp. 68-74. Pretoria, January 1913.

The writer mentions some facts observed by him in the laboratory of the Central Experiment Farm, Cedara, Natal, namely that some samples of arsenical dip fluids after being kept in the laboratory for a short time often showed a distinct loss in arsenite. The amount of total arsenic in the fluid remained constant; there was consequently an oxidation of the arsenite with formation of arsenates.

The writer quotes an article by Messrs. W. F. Cooper and G. A. Freak, in the *Journal of Agricultural Science* for October 1911, and the circular by Audrey V. Fuller, issued by the United States Department of Agriculture. In the latter the oxidation of the arsenite was attributed to the action of bacteria present in dip fluids under natural conditions. These bacteria possibly gained access to the tanks either through the water used in preparing the dip, or through the air or by the excrementitious or other matter derived from the live stock passing through the dip.

In the second half year of 1912 the writer conducted two series of experiments, in connection with the subject, in the laboratory at Cedara. Three dip fluids were prepared. The first was made up of sodium arsenite in pure water; the second contained excretory matter in addition, but otherwise was similar to the first; the third was made up according to Pichford's formula (arsenite of soda, paraffin and soft soap), with the addition of some excretory matter. Each dip was analysed immediately after it was prepared and also at the end of every month, for five months, the arsenite and the total arsenic being determined as arsenious oxide,  $As_2O_3$ . The amount of total arsenic remained constant in each sample; while the arsenite did not undergo any oxidation whatever in the first dip, it diminished rapidly in the other two dips, practically disappearing within two or three months.

A second series of investigations was carried out with a proprietary arsenical dip, kept in the open in the tanks, and in the laboratory in closed vessels. The data thus obtained bear out Cooper and Freak's conclusions, that the oxidation of the arsenite is far more rapid in the summer months than in the winter, owing doubtless to the greater activity of the bacteria at the higher temperatures.

Referring to the fact that sodium arsenate is much less efficacious as an insecticide than the corresponding arsenite, the writer points out the vital importance of the question to stock owners, and considers it essential that

(1) See: No. 2198, B. July 1911; No. 2425, B. Aug.-Sept.-Oct. 1911; No. 146, B. Jan. 1912, Nos. 358 and 359, B. Feb. 1912; No. 810, B. May 1912; No. 934, B. June 1912; No. 43, B. Jan. 1913. (Ed.).

they should have the contents of their tanks analysed regularly in order to have estimated the amounts of both arsenites and arsenates in the fluid ; for by the neglect of this precaution they would run great risks.

692 - **Destruction of the Pathogenic Agent of Foot-and-Mouth Disease: Experiments in Specially Constructed Manure Heaps.** — LOEFFLER, F. in *Berliner Tierärztliche Wochenschrift*, Year 20, No. 7, pp. 113-115. Berlin, February 13, 1913.

It has often been proved by experiment that temperatures of 60 to 70°C. (140 to 160° F.) may exist in manure heaps. As the agent of foot-and-mouth disease is killed by still lower temperatures, it may be concluded that manure from animals suffering from this disease is disinfected, if it is so kept that its temperature rises to 50 to 70° C. (120 to 160° F.) Hitherto, however, this had not been proved.

In 1912, the writer prepared a manure heap in such a manner that this temperature was quickly attained. He introduced the pathogenic agent into the manure and a few days later used it for inoculation.

The experiment was carried out as follows. A layer of straw 10 inches thick was laid down upon a concrete surface 9 ft. by 8 ft. to serve as a base upon which to pile up the manure. The latter was a mixture of fresh cow and pig manure containing much straw. In the experiment, fresh lymph was used ; it was mixed with a 0.9 per cent. solution of common salt in the proportion of 1 to 20, and filtered through Chamberland filters ; 15 cc. of this mixture was put into test-tubes, and some tubes of lymph were kept in the cellar to serve as a control of the virulence. In addition, the hoofs of a pig which had died of foot-and-mouth disease, were cut off, wrapped in gauze, and introduced. The writer used 12 numbered maximum thermometers for the measurement of the temperature. The thermometers, hoof-parings and lymph-tubes were equally distributed in the heap while it was being built up. Another thermometer was put between the layer of straw and the manure. The heap was built up like a mangel-clamp and pressed down with forks ; it was then covered with a layer of straw 4 inches thick, upon which was thrown a layer of dry earth of the same depth ; the total height of the heap was 6 feet. After ten days, the manure was again spread and the thermometers, lymph and hoofs removed. The different thermometers registered from 55.5 to 75° C. (132 to 167° F.).

Pigs were then inoculated with the lymph and also with the hoof-extract, but they did not fall ill ; but when inoculated with the control lymph they sickened. Thus the pathogenic agent must have been destroyed by the heat of the manure heap. It is therefore possible to make the manure from animals suffering from foot-and-mouth disease entirely free from infection, if the heap is constructed and managed in the manner described by the writer.

693 - **The Internal Application of Carbolic Acid for the Prevention of Contagious Abortion in Cattle. The Relation of Granular Vaginitis to Abortion.** — TAYLOR, W. J. in *Bulletin of the Montana Agricultural College Experiment Station*, No. 90, pp. 19-31. Bozeman, Montana, July 1912.

The experiments commenced in 1909 in three herds seem to warrant the following conclusions :

1). Carbolic acid, either fed in solution or injected hypodermically, seems to be a specific against contagious abortion.

2). Cows, as a rule, will eat with apparent relish as much as 750 cc. of a 4 per cent. solution of carbolic acid in feed daily.

3). The hypodermic injection as a treatment in an affected herd involves less labour than feeding.

4). In cases of impending abortion, carbolic acid can be injected in sufficient quantity to cause staggering gait and dilation of the pupil of the eye (when it should be withheld for from ten to fifteen hours and repeated) with no apparent unsatisfactory after-effects.

5). All males used for breeding purposes should be treated with carbolic acid either hypodermically or in the feed. The penis and sheath should be thoroughly disinfected, both before and after service. Contagious abortion and granular vaginitis may be transmitted through the medium of the male, unless proper precautions are observed.

6). Not all cows showing granular vaginitis abort.

7). Heifers pregnant for the first time are more liable to abort than during subsequent periods of gestation and should be carefully watched and vigorously treated, if abortion exists in the herd.

#### 694 - Plants Poisonous to Live Stock in Paraguay and in Misiones (Argentina).

BERTONI, MOISÉS S. in *Agronomía, Boletín de la Estación Agronomica de Puerto Bertoni*, Vol. V, No. 3-4, pp. 140-144. Puerto Bertoni, Paraguay, January-February 1913.

The writer agrees with Spegazzini that the toxicity of poisonous plants is generally due more to the stage of their growth than to their specific character. Besides, the quantity eaten by the animals, the age of the plants, and the conditions of climate and soil affect the degree of toxicity. There is no doubt that pastures with very young grasses are the most dangerous; it is well known that many herbaceous plants in their early stages contain hydrocyanic acid. In other plants this acid may be formed in the parts that are cut and kept for a few hours.

In Misiones there are several plants in the pastures which are poisonous when they are very young. Such are — according to the writer's observations — the Gramineae *Cynodon dactylon*, *Andropogon halepensis*, *A. condensatus* («aguarà-ruguai» or «cola de zarro»), *A. bicornis* («caapi San Juan»), *Panicum sanguinale* («kaapi-ahhi» or «falsa cebadilla de Misiones»). There are, however, some exceptions: castor oil plants are harmless when young and become poisonous when adult; the species of *Tragia* and of *Dalechampia* are harmless when young, but they are to be regarded with suspicion when grown up.

It is also known that drought and the compactness of the soil increase the toxicity of certain plants; in other plants, on the contrary, the writer has observed that they become more poisonous after abundant rain. Such is the case with some of the above-mentioned Gramineae, and perhaps manioc.

Among the poisonous or dangerous plants, the writer mentions further: *Commelina sulcata*, a species of *Tradescantia* (called «trapuerava» in Brazil),

*Bromelia fastuosa*, *Tragia volubilis* («ihsihpó-pihno»), *Manihot Tweedieana* (« guazil-mandio »), some Euphorbiaceae, *Polygonum acre* (caá-tás), *Brumfelsia Hopeana* (« jazmin del Paraguay » or « azucena », but rarely eaten by animals), *Solanum sisymbriifolium* (« revienta caballos » or « putui »), *Tabernaemontana Hilariana* and *T. australis*, *Spatocarpa sagittifolia* (which is avoided by live stock), *Equisetum giganteum* (which contains aconitic acid, or a nearly allied substance). The writer adds that this list is certainly still incomplete.

# ANATOMY AND PHYSIOLOGY

695 - Investigations into the Micro-Flora of the Large Intestine of Cow and Sheep. — CHOUKEVITSCH, JEAN in *Annales de l'Institut Pasteur*, Year 27, Vol. 27, No. 3, pp. 246-263. Paris, March 25, 1913.

The writer investigated the colon and caecum of five cows and five sheep, and found that the micro-flora in the organs of these two kinds of animals was not very dissimilar. The bacteria present in the large intestine of the cow are chiefly cocci and rod-bacilli; coli-bacteria always occur in large numbers; strepto-cocci, often in the degeneration stage and encysted, are present in largest numbers in the caecum, or in the upper part of the colon. Towards the rectum, the signs of degeneration become increasingly clear. The short-rods, which often occur in reduced numbers, form no spores within the intestine; they measure  $0.3\mu$  by  $4$  to  $6\mu$ . The micro-flora of the colon of the cow differs from that of the horse (previously studied by the writer) in that the rare bacteria are more numerous in the former; also the bacteria in the cow's intestine seem to preserve their morphological characters better. To determine the species, the most varied cultures were made and the writer succeeded in isolating, in addition to those already mentioned, the following species.

I. Agents of putrefaction: *Bacillus proteus vulgaris*, *B. Welchii*, *B. putrificus*, *B. sporogenes A*, *B. sporogenes B*, *B. sporogenes foetidus*, *B. sporogenes parvus*.

II. Proteolytic bacteria (not including agents of putrefaction): *Bacillus Ellenbachensis*, *B. hastiformis*, *B. flavescens liquefians*, *B. amylolyticus*, *B. mesentericus*, *B. megatherium*, *B. pyocyaneus*, *B. mycoides*, *Chlostridium proteolyticum*. In *B. mesentericus* the ruber-form was found more commonly than the *vulgatus* form.

III. Bacteria decomposing cellulose, hemicellulose and starch: *Bacillus gazogenes*, *Bacterium Rodella III*, *Bacillus amylobacter (butyricus)*, *B. amyli tenuis*, *B. Welchii*, *B. mesentericus*, *B. Ellenbachensis*, *B. amylolyticus*, *B. mycoides*. The formation of gas in the colon is attributed to the Rodella III group.

IV. Bacteria of acid media: *Bacterium Merejkowsky I*, *B. Moro*, *Streptobacillus anaerobicus magnus*, *Bacterium rosescens*, *Bacillus megalosporus*, *B. tenuis*; occasionally a coccus resembling *Micrococcus candidans* was isolated.

Of these bacteria, some always occur in the intestine, forming the constant micro-flora of this organ: *Bacterium coli*, cocci, *Bacterium Moro*, *B. Merejkowsky I*, *Bacillus Welchii (perfringens)*, *B. putrificus*, *B. sporogenes A*,

*B. hastiformis*, *B. flavescens*, *B. gazogenes*, *B. Ellenbachensis*, *B. mesentericus*, *Bacterium Rodella III*, and those decomposing cellulose. *Bacillus amyli tenuis* is probably also constantly present.

In sheep, the micro-flora is richer in species; streptococci are more numerous and usually more degenerated. In addition to those mentioned as found in the intestine of the cow, the following were isolated: *Bacillus tenuis non-liquefaciens*, *B. irregularis*, *B. ramiformans*, *Sarcina flava*, *Vibrio terrigenes Güntheri*, *Actinomyces albus*, *Bacillus hervolulus Zimmermanni*. The following always occur in the colon: *Bacterium coli*, cocci, *Bacterium Moro*, *B. Merejkowsky I*, *Bacillus Welchii*, *B. putrificus*, *B. sporogenes A*, *B. sporogenes B*, *B. mesentericus*, *B. Ellenbachensis*, *B. hastiformis*, *B. flavescens*, *B. gazogenes*, *B. amyli tenuis*, *Bacterium Rodella III*, cellulose-decomposing bacteria.

As the writer found a similar flora in horse, cow and sheep, and always bacteria which decompose cellulose, hemicellulose and starch, he considers that the composition of the flora depends less upon the species of animal than upon the kind of food consumed by the latter. In a later work the little-known species will be described.

696 - **Fluctuations in the Body Temperature before Parturition in Cow, Sheep and Goat.** — LIMMER in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 13, pp. 149-150. Hannover, March 28, 1913.

The results of the examination of the body temperature at the end of the last period of gestation in the case of 50 Black-spotted Lowland cows and of sheep and goats were as follows: The temperature rises during advanced gestation and sinks again before parturition; the fall begins in the case of the cow at 11 ½ to 56 hours before calving and in that of the sheep a week before lambing. In goats, a second decrease in temperature occurs one day previous to parturition.

697 - **The Pepsin and Chymosin Question.** — RAKOCZY, A. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 84, Part 5, pp. 329-353. Strassburg, 1913.

Experiments on the coagulation and digestion of milk in the stomachs of various mammals, according to which young ruminants, foals and pigs secrete, as well as pepsin, an independent ferment (chymosin) which coagulates milk. Opossums only produce pepsin, and the milk is coagulated by the action of this ferment. As neither pepsin nor chymosin is found in the stomachs of dogs and cats, the causes of milk coagulation in their case are unknown.

698 - **Report of the Zoometrical Studies made in 1912 at the Shows at Paris, Rouen and Poitiers.** — VOITELLIER in *Bulletin Mensuel de l'Office de Renseignements Agricoles*, Year 12, No. 1, pp. 46-63. Paris, January 1913.

The measurement data and the live weight estimations made on specimens of most of the French breeds of cattle, of three breeds of sheep (Charnoise, Oxford Down, Dishley-Merino), and of one breed of donkeys (Poi-tou). The height at the withers was taken as a basis for the measurements.

699 - **The Fertility of Hybrids in a Mammalian Species-Cross.** — DEILEFSEN, J in *American Breeder's Magazine*, Vol III, No 4, pp. 261-265 Washington, October, November, December 1912

BREEDING

Sterility is a common phenomenon in the hybrids obtained by mating members of distantly related groups or types, in both animals and plants. In case both sexes are sterile, a further genetic study becomes impossible. When one sex alone among the hybrids is sterile, that sex is usually the male; and since the females are fertile, it becomes possible to study their inheritance of characters and fertility of offspring by crossing them back to the males of either parent species.

Among mammals, at least, work on inheritance and fertility in species crosses is in its inception. The consensus of opinion is that the cross between horse and ass results in sterile male mules, but that the female mule is occasionally fertile with either the horse or ass (Waldow von Wahl, 1907). The zebroid (zebra  $\times$  horse) is supposed to be sterile in both sexes (Ewart 1899; Ivanoff 1911); the same is true of the zebra (zebra  $\times$  ass). When the cow and bison are crossed, they produce fertile female catteloes, but sterile males (Bond, 1908; Ivanoff, 1911). These female hybrids were crossed back to males of both parent stocks: the one-quarter bison females are fertile; the three-quarters were not fully tested, but are possibly also fertile. The one-quarter bison males are not always fertile, but Ivanoff reports a fertile three-quarters bison male.

The writer worked out the progeny of a cross between the wild Brazilian cavy (*Cavia rufescens*) and the domesticated guinea-pig (*Cavia porcellus*). The two forms differ consistently and clearly in colour, texture of hair, size, shape of skulls and skull sutures, tooth formation, etc. The original crosses between the two species were the result of mating the wild males to the tame females, but matings were secured with much difficulty. The reciprocal cross was not attempted, as it was feared that the smaller wild female would succumb in pregnancy when mated to the much larger tame males. The tame females bore their hybrid young in due time and with the usual guinea-pig average per litter, thus proving that the wild males were wholly fertile.

Having obtained these half-wild hybrids, the females were mated back to the wild males and the tame guinea-pig males, producing three-quarters and one-quarter wild respectively. The matings to the wild males were not very successful, and only one three-quarters wild male was reared to maturity. The latter proved sterile. The matings to the tame males were wholly successful and produced 83 one-quarter wild. The hybrid females of one generation back were mated to tame guinea-pig males and over 1700 hybrids of various blood dilutions were produced, ranging from  $\frac{1}{4}$  wild to  $\frac{7}{32}$  wild.

The problems to be resolved were as follows: how great must be the blood dilution, or for how many generations must the hybrid females be crossed back to the guinea-pig, to eventually produce fertile male hybrids? When fertile male hybrids are produced, would their offspring

be fertile in both sexes, if such males were mated to their hybrid sisters or guinea-pig females?

The breeding test being hardly sufficient to decide an animal's fertility, the writer devised a new test. He obtained a complete index of the males' fertility by making a small incision in the scrotum, puncturing the epididymis at one or two points and examining the liquid contents with the aid of a microscope. There was a great difference between individual hybrids; some males might not possess any sperm at all, but in their place were found a few, or many, incompletely matured spermatogonia; others possessed a few non-motile or motile spermatozoa in addition. Still others might have an abundance of motile spermatozoa, just as any normal male. All grades and combinations were found; but the last class alone could be successfully mated to females. The fertility of the hybrid males is shown by the following table:

Class of hybrids	Total number tested	Per cent. with any sperm	Per cent. with any motile sperm	Per cent. readily fertile
$\frac{1}{2}$ wild . . . . .	6	0	0	0
$\frac{1}{4}$ " . . . . .	22	25.0	0	0
$\frac{1}{8}$ " . . . . .	71	47.8	17.3	9.8
$\frac{1}{16}$ " . . . . .	94	71.1	46.6	35.5
$\frac{1}{32}$ " . . . . .	89	88.7	62.9	60.7
$\frac{1}{64}$ " . . . . .	21	100.0	66.7	66.7

After a careful examination of the mobility of the spermatozoa, the writer considers that every male which has an abundance of motile spermatozoa is undoubtedly fertile. Such fertile males are especially numerous in hybrids with least wild blood, as is shown by the table.

The male hybrids derived from crosses between a fertile male hybrid and a female hybrid, gave all grades between absolute sterility and fertility; but when a fertile male hybrid was mated to a guinea-pig female, all the male offspring were fertile.

The guinea-pig colour, coat, size and anatomical characters were transferred to the hybrids. Any combination of these characters may be united with fertility. It is conceivable that desired characters in hybrids between other mammalian species (including cattaloes and mules) may be combined with fertility of both sexes, in the same manner.

700 - **Mendelism and Interspecific Hybrids.** — Cook, O. T. in *The American Naturalist*, Vol. XLVII, No. 556, pp. 239-245. Lancaster-Garrison-New York, April 1913.

A criticism of Dr. Nabour's treatise on crossing *Bos indicus* with *Bos taurus*, which appeared in No. 547 of the above-mentioned periodical (1).

701 - **The Exportation of German Stud Stock, especially to the Colonies.** — NEUMANN in *Deutsche Landwirtschaftliche Presse*, Year 40, pp. 311-313. Berlin, March 29, 1913.

The writer estimates from the official statistics that in 1909, 7128 horses were exported from Germany, of which 5123 were horses for the knacker, 929 draught horses, 798 carriage, riding and race horses, 99 ponies, 97 stallions and 82 foals. The horses for slaughter and those used for purposes other than breeding, were chiefly sent to Switzerland, while the stallions went to the Netherlands and the foals to Austria-Hungary. German stud horses were also imported by Belgium, Denmark, France, Russia, Sweden, Switzerland, the United States (28 stallions), Brazil, German South-West Africa (8). Many animals of the Holstein, Oldenburg, Hanoverian and East Prussian breeds were exported.

In 1909, 10 455 head of cattle were exported, of which 36 per cent. were bullocks for the butcher. Most of the butcher's beasts were sent to Switzerland, the stud cattle going to Austria-Hungary, Russia (255), German South-West Africa (73), Kamerun (7), Chile (12), Brazil (5), and the United States (3). The Black-spotted Lowland cattle are in much request abroad, especially in Russia and Austria-Hungary. Red-spotted Holsteins, and especially Angles, are prized in the Russian Baltic Provinces. In addition were exported cattle of the Grey-Brown Mountain, Höhen Spotted (to Russia, Argentina, China), Frankish, Red Central German, Pinzgau and Algäu breeds.

Of the 53 889 sheep exported the same year, most of those destined for mutton were sent to Switzerland. German stud sheep went to Russia, Austria-Hungary, France, Denmark, Servia, British South Africa, German South-West Africa, Australia, Brazil, Uruguay and Chile.

The number of goats and pigs exported was negligible.

The exportation of cattle to German East Africa, German South-West Africa and Kamerun is attended by the following restrictions which came into force on January 8, 1913.

1) Cattle may only be exported from districts which are declared free from foot-and-mouth disease, and from herds in which there has been no case of this disease for eight months.

2) The vendor is required to produce official proofs of the fulfilment of these conditions.

3) Animals may only be exported from Hamburg, and before embarkation must remain for 14 days under observation at the inspection station established by the German Agricultural Society in that city. (2).

(1) See No. 1318, *B. Sept.* 1912, for a notice of this article.

(2) Founded in 1909.

(Ed.).

4) On arrival in the Colonies, the cattle are subjected to 28 days' quarantine.

702 - **Small Breeders' Associations in Italy.** — VEZZANI, VITTORINO. — *Pubblicazioni del Comitato Nazionale per la Mutualità agraria*, pp. 156 Rome, 1913.

Breeding Syndicates have arisen during the last thirty years and have spread throughout Europe. They are especially numerous in Austria, Belgium, Denmark, Germany, Norway, Holland, Sweden and Switzerland; while they are in course of formation in France, Italy and Russia; Japan has already a good number.

According to recent statistics of the ministry of Agriculture, Italy now possesses 133 Associations of this description, of which the greater number have come into existence during the last seven years.

In Italy, the most suitable legal form for Breeding Societies is that of the ordinary Civil Association in the case of syndicates without share-capital, and of the Cooperative Society in that of syndicates with share-capital.

The Horse Breeding Syndicates, which have been established in Italy under the name of "Consorti Stallonieri", use most of their share-capital for the purchase and maintenance of a selected stallion to serve the mares belonging to the members.

The Cattle Breeding Associations are of greater importance to Italian agriculture, on account of the great development of the cattle-breeding industry. The Breeding Syndicates have assumed different forms, ranging from the most simple to the most complex. There are so far, with one exception, no societies for the improvement of sheep, goats and pigs, nor any small poultry associations.

No Federations of Breeding Syndicates yet exist in Italy.

703 - **List of Stud Book Associations.** — *Illinois Stallion Registration Board, Bulletin* No. 3, pp. XVII + 254. November 1, 1912.

This bulletin contains a list of all the American and Foreign Stud Book Associations authorized by law, which are the only associations that the Illinois Stallion Registration Board is permitted to recognize (see Section 7, Law regulating the Public Service of Stallions in Illinois, amended June 5, 1911). A directory of the licensed stallions on November 1, 1912, is given, with their number, breed, date of foaling and the names and addresses of their owners. There are now 9677 stallion licences in force; of this number 5688 are for pure-bred horses, 3984 for grades and 5 for cross-breds.

704 - **The Annual Live Stock Show at Santiago, Chile, in 1912.** — *La Exposición Anual de Animales — Boletín de la Sociedad Nacional de Agricultura*, Vol. XLIII, No. 11, pp. 689-713 Santiago, November 15, 1912.

An account of the annual live stock show organized by the National Agricultural Society (Sociedad Nacional de Agricultura), which was opened on October 16, 1912.

There were 570 head of horses and cattle exhibited, as well as poultry.

A complete list is given of the prizes awarded, and the article contains photographs of some of the animals.

705 - **The Shire Horse Show.** — *Live Stock Journal*, Vol. LXXVII, No. 2030, pp. 210-215. London, February 28, 1913.

In February 1913 the thirty-fourth annual show of the Shire Horse Society was held. The prize money and breeders awards amounted to £ 2230 and the number of horses entered was 685: The article gives a detailed description of the various sections and the list of prize winners.

706 - **London Hackney Show.** — *Live Stock Journal*, Vol. LXXVII, No. 2031, pp. 239-246. London, March 7, 1913.

The twenty-ninth annual show of the Hackney Horse Society was opened at the Royal Agricultural Hall, Islington, on March 4, 1913, and was continued until the evening of March 7. The entry was some 572, against 611 last year. The prize money amounted to £1844. This article describes the exhibits in the 43 classes, and gives a list of awards made up to the evening of March 6.

707 - **Thoroughbred and Hunter Show.** — *Live Stock Journal*, Vol. LXXVII No. 2032, pp. 270-274. London, March 14, 1913.

The twenty-ninth annual London Show of the Hunters' Improvement and the National Light Horse Breeding Society was opened on March 11. The number of horses entered was 306, and £ 9850 were offered in Premiums, Super Premiums and prize money.

The article describes the various classes of Thoroughbreds and Hunters, and gives the list of the prize winners.

708 - **Report of the Eighth Systematic Show of Mileh Cows of the Brown Breed on September 28, 1912, at Crema, Italy.** — *Pubblicazione della Cattedra ambulante d'agricoltura e del Consorzio agrario di Crema*, pp. 34 Crema, 1913.

An illustrated brochure with a preface written by Dr. Z. Camertoui explaining the aim, organization and importance of the Crema show, and giving the reports of the judges of the fourteen sections (the system of having *one judge* being maintained) as well as the complete list of the prizes awarded.

709 - **The Italian Artillery Horse.** — PIROCCHI, ANTONIO in *Giornale d'Ippologia*, Year 26, No. 7-8, pp. 3-7. Pisa, April 1. 1913.

The question of the breeding of artillery horses is one of great importance for Italy.

After considering the nature of the work required of these horses, the writer gives a list of the qualities necessary for them. From the point of view of build, the artillery horse, especially the wheel-horse, which has the heaviest work, should be thick-set, with very short legs, solidly built; straight, short and broad in the body, and supported by strong legs, with straight action. According to the excellent description given by Capitain Ajroldi the wheel-horse comes at the limit of the category of fast heavy horses, belonging to the lightest of these, or at the limit of light horses, being the heaviest of these.

Its weight should be considerable, and varies from 1100 lbs. to 1200 lbs.

The height at the withers should be equal to the length taken from the point of the shoulder to the end of the rump. In general, the height at

HORSES,  
ASSES AND  
MULES

the withers should vary from a minimum of 15 hands to a maximum of 16 hands, while the optimum is between 15.2 and 15.3. The transverse development of the body should be great, and the girth should exceed the height by one-eighth.

*Blood* is a very important asset in the case of the off wheel-horse, and is indispensable to the near mounted horse. The more rapid the work the more breeding is required ; but this should never be excessive, as what is most necessary is the maximum equilibrium between the working of the nervous system and that of the organs of locomotion. Artillery horses should be quiet and stand cannon fire well. They must trot more or less fast according to the type of artillery for which they are intended. Further, they must be able to stand great fatigue, and under the worst possible conditions ; in fact they must above all be very strong and possess much staying power, which latter can be developed by systematic exercise.

Without dwelling upon the very complicated question as to the best manner of increasing the production of artillery horses in Italy, the writer devotes a few words to certain fundamental points whose observance is necessary for the solution of the problem.

These may be summarized as follows :

1) It is necessary to study thoroughly the horses of the different districts of Italy, in order to be able to form horse-breeding zones and to determine the course to be followed in each of these for the purpose of rearing horses for the army.

2) By means of propaganda, horse shows and competitions, and so-called traction races, etc., it is well to make the breeders acquainted with the qualities necessary for the artillery horse and the rules to be followed in breeding and rearing it.

3) The breeders should be assured of obtaining a remunerative price for their horses ; this might be effected by raising the prices and giving special prizes, so that the profit to be gained may act as an incentive to the production of the horses which are needed.

710 - **Marsh Ponies of the United States.** — CURTIS, R. S. Marsh Ponies of our Eastern Coast. — *The Breeder's Gazette*, Vol. LXXIII, No 4, pp. 191-192. Chicago, January 22, 1913.

The Marsh Ponies of the eastern coast of the United States probably owe their origin to the numerous groups of small horses which have lived for some centuries in a half-wild state on the narrow banks of land adjacent to the shores of Virginia, the Carolinas and to some extent further south along the coast of Georgia and of Florida.

The soil of these banks and islands is very sandy and often marshy, and the vegetation growing upon it so poor as to seem to preclude the persistence of a breed of horses even of this diminutive size.

The banks of the greatest importance in the production of these ponies are found to the east and north of Pamlico Sound, and more especially those islands or banks just east of Carteret county (North Carolina).

The writer has made some researches on the origin of these half-wild horses and after mentioning the opinions of several authors, he concludes by affirming the possibility that marsh ponies are the descendants of horses imported by the first settlers, it appears towards the end of the sixteenth century.

The ponies, which graze in full liberty on the islands of the coast, belong to several owners who brand all their animals. Every year during May, June, July and August the whole drove from each of the banks is rounded up in pens and the colts following their mothers are caught and a brand is put on them corresponding to that of the mother. In this way each owner is enabled to recognize his stock at future penning. All yearlings which are found without brands are turned over to the drivers to be disposed of; thus all discussion is avoided.

The ponies sell on the banks at \$50 (£10) to \$75 (£15), and even more for the better ones. The younger ones fetch from \$25 (£5) to \$35 (£7) each.

After the penning the ponies which have not been disposed of are allowed to return to their accustomed haunts, where they gather during the breeding season, each stallion with a band of mares. In the foaling season the mares select a secluded spot, where they remain until after their maternal duties are over.

The stock of the low lands runs 10 to 12 hands in height, while in some favoured conditions the size may be considerably larger. Their colour varies greatly. Some are bay with some inclination to shade into a mouse colour, others blood bays, dark brown, cream, sorrel and mouse colour, etc.

The ponies are very hardy and serviceable for light work. When first taken from their home they are somewhat shy and when they come in the early season they are covered with a long thick mossy hair. With proper grooming and feeding this can soon be removed and the coat becomes sleek and glossy. When properly cared for they possess considerable beauty. They have very shapely heads, fairly clearly-cut lines and clean legs. The feet are rather tough and small. They make very serviceable saddle ponies and light drivers. On the coast they are used to broad-tired carts by the farmers and fishermen.

According to reliable statements, about 150 ponies are raised each year in Carteret county. From Beauport inlet to Portsmouth near Ocracoke inlet, it is estimated that there are 1100 ponies on the beach.

No particular attention seems to be paid in the Carolinas to the improvement of these animals, the owners being satisfied with the present sufficient remuneration.

711 - The Poitou Mares of France. — АСТОН, J in *The Breeder's Gazette*, Vol. LXII, No. 11, pp. 663. Chicago, March 12, 1913.

A short account of the mule-breeding industry and a description of the Mulassière breed of mares used, of which there are about 25 000 in the old province of Poitou. The annual production of mules is about 12 000 head. The writer also gives data respecting mule rearing and feeding,

the trade in these animals (which are mostly exported) and the average prices they fetch. Small mules are sold at from \$200 to \$220; larger animals at \$240 to \$290, and a few even reach \$360.

## CATTLE

712 - **The Inheritance of the Property of Milk Production and the Utilization of the Results Obtained by the Control Society.** — PETERS, J. in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 11, pp. 121-125; No. 12, pp. 133-135; No. 13, pp. 145-149. Hannover, March 1913.

The writer has investigated the inheritance of milk production in a registered herd of Dutch cows in East Prussia. The milk yield and pedigree of the animals has been registered since 1884. As the milk yield of a herd during 28 years (1884-1912) can be much affected by external circumstances, the average production of the herd for each year of this period was estimated; it amounted to 7799 lbs. in 1884 and 9957 in 1912. The milk yield of the herd was especially high in 1896 and 1907. In order to determine the cause of this increased production, the writer, in the first place, ascertained the influence in this direction exerted by the bulls which were most often used as sires. The following were determined: 1) average milk yield in particular years of all the daughters of each bull; 2) how this yield compared with the milk production of the other cows of the herd during the same years; 3) the average milk yield of the dams of cows sired by these bulls; 4) how the average yield of the daughters compares with that of the mothers.

On the basis of these investigations, the writer concludes that the increased yield during the period 1896-1906 is chiefly due to an improvement in the average quality of the herd, while the further average increase of 1907 to 1912 is primarily attributable to the better feeding and tending of the animals.

After the writer had investigated the development of the milk yielding property of the herd, and ascertained the quality of each single cow as a milk producer, he divided the cows into classes and investigated how the milk yield of the offspring compared with that of the mothers. The data, which are arranged in tables, show that there are great variations in the inheritance of the property of milk production. The offspring of the best mothers yielded, on an average, the most milk and those of the inferior mothers the least. The range of variation was, however, not so great among the daughters as among the mothers. First class cows produced both good and inferior offspring, and the opposite is true. The inheritance varied around a centre, which was somewhat higher in the daughters of superior mothers than in those of inferior cows. The magnitude of the variation was the same for all the classes. (1).

Peters then determined the milk production of the grandparents, and of the separate families of the herd. With regard to the families, he found that some produced relatively many good animals, while the de-

(1) Cf. also "Cow Testing in the Breeding of Dairy Cattle", No. 1550, B. Nov. 1912, especially pp. 2478-2480. (Ed.).



Fourteen six-weeks-old pigs of the improved German breed were selected and divided into two lots, each containing 4 hogs and 3 sows. All the animals were given skimmed milk, crushed barley and a little powdered chalk (about  $\frac{1}{4}$  oz. per head per day). At the commencement of the experiment half of the barley was replaced by hominy for group II. As the pigs became older, the rations were increased in proportion to the gain in live-weight, and in lot II more of the barley was replaced by hominy; towards the end of the experiment they got nearly twice as much hominy as barley. The feed was given moist four times a day.

The experiment lasted from June 12 to September 3, and no bad effects were observed, but the pigs did not seem very keen on their food.

The animals were weighed singly and fasting at the beginning of each week and at the commencement and close of the experiment; the average of these results was taken. These data are given in the table on p. 931.

Although the experiment with hominy was satisfactory, the writer does not consider it advisable to replace barley by larger quantities of hominy, and still less to substitute the latter entirely for the former, as the appetite of the animals would be affected by the change.

715 - **Fattening of Pigs with the Automatic Feeder (1)** — DE LA BARRE Aufzucht und Mästung von 4 sechs Wochen alten Ferkeln am Futterautomaten. — *Tierernachrichten der Landwirtschaftskammer für die Provinz Brandenburg und Mitteilungen der Versuchsstation für landwirtschaftliche Fütterungsversuche zu Karsstädt (Westpreußen)*, Year 6, No. 2, pp. 15-17. Prenzlau, February 16, 1913.

Two sow pigs and two hogs were fed by means of the dry-feeding automatic apparatus from their fortieth day until they were fattened. At the beginning of the experiment, the dry food consisted of 2 parts crushed barley, 1 part wheat meal and  $\frac{1}{3}$  part fish meal freed from fat. Each pig received also daily for the first week about a quart of whole milk and  $2\frac{1}{2}$  quarts of skimmed milk mixed with a little sifted crushed barley and fish meal, and for the following 10 days  $3\frac{1}{2}$  quarts of separated milk. This first ration was intended as a preparation for pure dry feeding. Subsequently, the following substances were put into the automatic apparatus in addition to those above mentioned: "Fattinger's Körner blutfutter II", crushed beans, ground maize, ground rye and potato flakes.

From the beginning of the fourth week up to the end of the experiment, the dry food was made as shown on the opposite page.

In addition to the dry feed the pigs also received comfrey (*Symphytum aspernum*), cabbage and beet leaves, garden refuse, and sliced mangels. To encourage digestion, a small quantity of Teichel's digestive salt "Pekubus" was mixed with the food.

The pigs developed normally. One of them was sold to the butcher at the age of 22 weeks, while the other three were fat when they were 26

(1) See the diagram and description of an automatic feeding apparatus in No. 372, below; references given there. (Ed.).

Week	Crushed barley	Wheat meal	Potato flakes	*Körner- blut- futter II.	Fish meal	Crushed maize	Crushed rye	Crushed beans
IV . . .	7	5	1	0.6	0.6	—	—	0.2
VIII. . .	5	5	1	0.5	0.5	0.3	0.3	—
XIV. . .	5	5	2	0.5	0.5	3	3	—
XVIII. . .	10	10	5	1	1	10	6	—

weeks and 3 days old. The results of the experiment may be summarized as follows :

Weight of pigs at beginning of experiment . . . 84.7 lbs.  
 " " " end " " . . . 839.3 "  
 Increase in weight . . . . . 754.6 "

*Average increase in weight per head, per day:*

when 6-12 weeks old . . . . . 16  $\frac{3}{4}$  oz.  
 " 12-16 " " . . . . . 22  $\frac{1}{4}$  "  
 " 16-20 " " . . . . . 26 "  
 " 20-22 " " . . . . . 26  $\frac{1}{2}$  "  
 " 22-26  $\frac{1}{2}$  " " . . . . . 24  $\frac{1}{2}$  "

£ s d

Total cost \* of feeding. . . . . 10 14 10  
 Cost of food per 100 lbs. live weight . . . . . 1 8 5

\* Garden refuse and mangels, which were eaten in small quantities only, are not reckoned.

716 - **An Experiment in Pig Feeding and Fattening on Sugar Cake (Brand B.)** (1).  
 MANICARDI, C. in *L'industria lattiera e zootecnica*, Year 11, No. 6, pp. 86-87. Reggio Emilia, March 15, 1913.

This experiment was made on 40 pigs, divided into two lots of 20 each; of which one was given farinaceous food as is customary in the district, while the other was fed sugar cakes (Brand B.) supplied by the Italian Distilleries of Milan. The two lots also received whey and bran.

The pigs ate the cake with avidity, and when the animals were slaughtered, the flesh presented its usual appearance, while the fattening results were superior to those obtained with farinaceous food; further, the sugar cake proved to be the more economical feed.

(1) This cake is composed of: grape pomace meal, dried distillation residues and molasses. For experiments in feeding milch cows with this product, See No. 1551, B. Nov. 1912. (Ed.)

- 717 - **Fattening Hogs in Nebraska** (1) - SNYDER, W. P. and BURNETT, E. A. *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Article II (No. 124), pp. 71. Lincoln, Nebraska, June 15, 1912.

The results of previous experiments are summarized and full details are given of the recent experiments.

The bulletin is divided into two parts ; the first deals with the use of alfalfa hay with corn for fattening hogs ; the second is devoted to a comparison of corn, corn and alfalfa, with supplementary foods for fattening hogs.

The conclusions are the same as those published in the preceding Bulletin, No. 123.

#### PULTRY

- 718 - **A Comparison between Natural and Artificial Incubation.** — BRECHEMIN, L. in *Giornale degli Allevatori*, Year IX, No. 3, pp. 21-24. Catania, February 15, 1913.

In describing the results of some comparative experiments in natural and artificial incubation, the writer first states that no comparison can be made in the period from December to the end of February, because it is then very difficult to find broody hens. Turkey hens can indeed be obtained, but their use entails great inconvenience, for as their time of incubation is longer than of fowls, they crush some of the chickens the first day of hatching unless these are removed on the nineteenth day, when after having been placed for some minutes in tepid water, they can be hatched in an incubator.

The experiments were made during March, April and May. Three turkey hens and three fowls were used on the one hand, 100 eggs being entrusted to them, while the parallel experiment was carried out in an incubator with a warm water tank, the heat being maintained by means of a small lamp.

This incubator was provided with a regulator ; the egg chamber was deep and the bottom was concave and covered with wire gauze. A hundred eggs were placed in the incubator every month.

After incubation, the eggs were examined by being held up to the light and the clear and infertile ones removed. The incubation results were as follows :

*Natural incubation* : 242 fertile eggs produced 158 chicks

*Artificial incubation* : 243 fertile eggs produced 209 chicks

Thus the results were entirely in favour of artificial incubation. In order to prove this fact thoroughly, a comparison was instituted between natural and artificial rearing.

The food was the same in the case of all the chickens ; it consisted for the first three days of a mash of hard-boiled eggs, and subsequently of soaked bread, boiled potatoes, boiled rice, maize cake and meat meal for the mash, with crushed millet, oats, and buck wheat. The chickens entrusted to the hens and turkeys were kept in open houses and allowed the run of a grass park of about a quarter of an acre in extent. The artificially reared chickens were kept on a space only two-thirds of the size and housed in

a large shed glazed in front. The brooder was of very simple construction, with a zinc plate and petroleum lamp and was provided with a small adjoining run enclosed with wire-netting and glazed.

Three months after hatching the results were as follows. Out of 158 chicks reared naturally, 75 were alive, while 194 of the 209 artificially-reared birds had survived. The loss, which exceeded 50 per cent. in the case of naturally reared chickens, (being larger with turkey foster-mothers than with hens), was only 10 per cent in that of the artificially reared chickens.

The loss is however, much less if the fowls are kept in coops or in closed houses.

In conclusion, the writer states that, though natural incubation and rearing are perhaps to be recommended for small poultry breeders, and for raising breeding birds, the resulting chickens being more robust, artificial methods are preferable in the case of large poultry farms.

719 - **Experimental Work in Artificial Incubation.** — BROWN, W. in *The Journal of the Board of Agriculture*, Vol. XIX, No. 11, pp. 909-914. London, February 1913.

The writer mentions the fact that the results obtained by artificial incubation are not equal to those obtained by natural means. He gives, in this connection, an account of experiments which R. J. Terry, poultry expert to the Tasmanian Government, has been carrying out for the past ten years. Mr. Terry suggests that eggs receive too much air in modern incubators, and draws attention to the fact that the irregular broken ring of blood, which sometimes occurs before the sixth day instead of the "spider" seen with a living embryo, is more common in eggs from incubators which have excess of ventilation than in others. Fewer chickens are hatched in well-ventilated incubators.

720 - **The Württemberg Apicultural Stations for the Production of Selected Queen Bees.** — *Die Bienenpflege*, Year XXXV, No 4, pp. 73-77. Weinsberg, April 1913.

A report of the work of the Stations for the production of selected queen bees of the German breed.

721 - **Automatic Fishing Apparatus.** — *Bollettino della Società lombarda per la pesca e l'acquicoltura*, Year VI, No. 3, pp. 37-40. Milan, March 1, 1913.

This article deals with a new system of fishing effected by an apparatus devised by Cav. Giuseppe Pino and already patented.

The automatic fisher consists of a framework of pieces of wood fastened together by means of coupling boxes in a form suitable for making the bottom of the apparatus. Upon this are fixed 16 very strong poles, which are kept vertical to the framework by means of three stays to each pole and by wire ropes. At the summit of these poles are affixed 9 bags of netting corresponding to the 9 squares formed by the framework. These bags, which are 22 feet deep, are in the shape of a funnel and have a wooden sliding valve at the bottom, dividing the bag into a larger and smaller part, the latter serves to catch the fish and is capable of being emptied once, or oftener during the day.

In the centre of the framework, below the central bag, is situated the receptacle for the compressed air, which causes the ascent and descent

of the apparatus, and is kept in place by 16 metal cords affixed to the framework. The mechanism which works the apparatus consists of a motor feeder, and a compressor of sufficient power, used to pump the air into the accumulator. The latter, which has an india rubber tube fitted with a tap, is attached to the raising receptacle of the apparatus.

The apparatus descends on closing the tap which admits the air, and on opening the one which allows the air to escape. The special arrangement for the vertical descent and oblique ascent of the apparatus consists of small wooden regulators placed on the principal base framework.

The apparatus can be constructed on a small or large scale, and fishing can be done at great or small depths. For fishing with this apparatus, a motor boat of about 10 H. P. is necessary; part of this force is used for compressing the air. In order to raise the automatic fisher, when once it has descended to the bottom, it suffices to subject the air in the receptacle for ascending to a pressure exceeding that of the water at this depth. The apparatus, while ascending, can be dragged by the boat (by means of the rope by which it is attached to the latter) in such a way that it can assume at will a vertical or oblique position.

The fisher is so balanced that, in spite of its weight of about 10 tons and its surface of 1100 sq. yds. it floats perfectly, raising the bags of the nets above the water and allowing the boats to pass between these to see whether any fish have been caught, and remove the spoils, if the nets are full.

The apparatus was successfully tested in the Lake of Zurich and the inventor is making a second of 840 sq. yds. in size, with only four bags, which he intends trying in the Mediterranean.

The cost of the automatic fisher is about £320 and together with the motor boat, the whole price would amount to £800.

722 - **Actinomycosis of Prussian Carp.** — PLEHN, MARIANNE in *Allgemeine Fischerei Zeitung*, Year 38, No. 9, pp. 222-224. Munich, May 1, 1913.

The writer describes in the text, and with the help of illustrations, a new chronic fish disease, actinomycosis, due to a fungus. The latter attacks Prussian carp (*Carassius Carassius*), producing abscesses in the kidneys or other internal organs. The external symptoms of the disease are the sluggish movements and the swelling of the body of the fish.

723 - **The Effect of X-Rays upon the Development of the Ovary of the Rabbit.** — REGAUD and LACASSAGNE in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 11, pp. 601-604. Paris, March 21, 1913.

The writers tried the effect of the X-rays upon several rabbits' ovaries and found, upon examining the latter some hours later, that the follicle cells had been injured. The stronger the X-rays used, the more the follicle cells were harmed. A fortnight after the ovaries had been exposed to the rays, all the follicles, with the exception of some small primordial cells invisible to the naked eye, had disappeared. With the disappearance of the follicles, the activity and formation of the interstitial glands of the follicle capsules decreased. About 3 months after the X-ray treatment, the writers observed a new formation of the glands on the surface of the

ovary, but they were much less active than before. The follicle cells which remained unharmed gradually grew to normal and abnormal Graafian follicles within 6 months. The former gave rise to ova, which were capable of fertilization and produced normal offspring. The writer observed no fresh formation of ova, nor any reappearance of follicles which had disappeared on exposure to the X-rays.

## FARM ENGINEERING.

- 721 - **New Cultivator.** — *Wiener Landwirtschaftliche Zeitung*, Year 63, No 26, p. 310. Vienna, March 29, 1913.

AGRICULTURAL  
MACHINERY  
AND  
IMPLEMENTS

This new cultivator consists of a three-wheeled carriage, supporting an adjustable frame containing tines similar to those carried by extirpators. The depth of the tines can be adjusted up to  $7\frac{1}{4}$  inches. Behind these tines there are four adjustable disks intended to break up the soil loosened by the tines. If these disks are not suitable to some kinds of soil they can be replaced by a toothed harrow. As this implement works a strip 16 feet wide at a time, and can be quickly drawn by the smallest steam ploughing engine, the amount of work it can do is very considerable. It is especially adapted for paring a field after the harvest and for loosening and preparing for sowing fields that have been deeply ploughed before the winter, or that have borne potatoes or beets.

- 725 - **Trials of Mechanical Ploughing Tackle at Sétif and Maison-Carrée (Algeria).** MARMU, M. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, First Half-year, No. 1, Vol. 119, pp. 147-157. Paris, January 1913.

These trials lasted from May 26 to June 12, 1912, and were held partly at Sétif and partly at Maison-Carrée. The following five machines were sent to be tested.

The C. I. M. A. tractor (Titan).

The Avery tractor.

Landwin's agricultural motor.

The tractor of the Case Co. (a French firm)

J. and H. MacLaren's tractor.

The article contains tables giving the dimensions and characteristics of the machines, as well as the amount of force required for the work done, the time required, the depth and width of the ploughing and the amount of fuel used.

These trials did not give the expected results, for the nature of the soil to be ploughed had not been taken into account in the construction of the machines. The commission are of opinion that tractors with explosion motors cannot be introduced into North Africa until the taxes on motor spirit and petrol are reduced.

- 726 - **The Use of Mechanical Power in Agriculture** (1). — SCHWANECKE, H. K. in *Fühings Landwirtschaftliche Zeitung*, Year 62, Parts 7 and 8, pp. 242-272 and 286-306. Stuttgart, April 1 and 15, 1913.

After some preliminary remarks on the most important power-driven agricultural machines, the writer compares the various systems of mechanical ploughing from the points of view which have the greatest interest for farmers, such as cost of installation, weight of the principal parts, performance, number of hands and team required, saving of teams and of working expenses, utilisation of the motor for other objects.

In the second part of the paper he treats of transport machines and especially of field railways and motor waggons.

- 727 - **Electricity and Agriculture**. — KOPPEL, R. in *Monatshefte für Landwirtschaft*, Year VI, Part 4, pp. 97-110. Vienna, April 1913.

The writer gives a very instructive review of the present state of the application of electricity to agriculture. After introductory remarks on the cost of electric motor power and on the approximate amount of power required by the most commonly used agricultural machines (threshing machines, electric milkers, cereal cleaners, scutching and shearing machines), he discusses electric incubators and brooders.

The writer then considers tilling by electricity and its economy, and gives an example of the total cost of such an installation.

After a brief mention of recent experiments on radio-activity, the paper concludes with remarks on the production of electricity.

- 728 - **Agricultural Machines at [the Machine Exhibition in Paris in 1913]**. — COUPAN, G. in *La Vie Agricole et Rurale*, Year 2, No. 18, pp. 485-493. Paris, April 5, 1913.

The writer gives a detailed description and diagrams of some of these machines for working the ground, which are distinguished by innovations and improvements. He mentions Massignon's subsoil plough, Bajac's draining plough, Letroteurs' balance plough and also Bajac's balance ploughs. Machines for mechanical ploughing are also described, such as the steam ploughing engine of the "Société Française de matériel agricole et industriel", the Avery, Fowler and Doizy tractors, the Stock motor plough and others.

- 729 - **Motor Power Cultivation with only one Winding Drum**. — RINGELMANN, M. in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, 1st Half-Year, Vol. 119, No. 2, pp. 352-357. Paris, February 1913.

The writer describes and illustrates the machines of E. Kuntz and of A. Bajac which were exhibited at machine shows in Paris and explains their working.

- 730 - **The Mesmay Tractor**. — DE CONDÉ, F. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, First Half-year, Vol. 119, No. 2, pp. 350-352. Paris, February 1913.

A description, with figures, of the Mesmay tractor, together with an account of its performance at the Bourges trials.

**731 - New Patents for Agricultural Machines and Implements.**

- 53 969,45a (Austria). Motor plough.
- 58 976,45a (Austria). Motor plough, in which the revolving driving pawl moves in a fixed guide.
- 59 532, 45 a (Austria). Outfit for double engine system of ploughing.
- 59 539, 45 a (Austria). Motor plough with vertically adjustable steering wheel, provided with a coulter flange, running on the unploughed land.
- 59 537, 45 a (Austria). Apparatus for tilling the soil, with revolving disks mounted obliquely on a shaft.
- 59 538, 45 a (Austria). Turn-wrest plough.
- 59 331,2 a (Switzerland). Automatic device for turning and fixing the working parts of multiple ploughs.
- 450 965 (France). Fore-carriage for ploughs, on two or three wheels, with the beam below the axle of the side wheels.
- 451 372 (France). Implements for motor ploughs.
- 259 163, 45 a (Germany). Apparatus running on rails, especially turn-wrest plough for market gardens.
- 259 165, 45 a (Germany). Subsoil loosener for ploughs.
- 259 083, 45 a (Germany). Hoeing outfit for tilling machines, with hoes fastened by means of intermediate parts to separate disks.
- 259 085, 45 a (Germany). Apparatus for tilling the soil with several implements mounted on a revolving axle and working successively.
- 259 260, 45 a (Germany). Motor plough with driving wheel running in the furrow behind the plough shares.
- 2057 (England). Self-propelled tractor.
- 16 160 (England). Power-driven tillage machine.
- 4930 (England). Motor plough.
- 1 056 532 (United States). Plough lift for gang ploughs.
- 1 056 531 (United States). Plough lift for gang ploughs.
- 58 970, 45 a (Austria). Spring-tooth cultivator, with teeth working in the wheel ruts.
- 59 587, 2 a (Switzerland). Cylinder for field and pasture rollers.
- 59 332, 2 a (Switzerland). Ribbed roller clod-crusher.
- 1056 514 (United States). Rotary harrow.
- 450 871 (France). Apparatus for cleaning rotary harrows.
- 451 393 (France). Spring tine cultivator.
- 58 975, 45 a (Austria). Manure coverer for ploughs, which by a swinging movement removes the manure from the coulter and share-point.
- 59 269,45 a (Austria). Manure distributor for machine dibbles.
- 59 271,45 a (Austria). Manure distributor.
- 1056 577 (United States). Guano distributor.
- 59 273,45 a (Austria). Potato planter.
- 259 261, 45 b (Germany). Multiple-furrow potato-planter, with chain of cups under hopper.
- 1898 (England). Drill for turnip and other seeds.
- 58 967, 45 b (Austria). Grass mower with reaping attachment.
- 58 973, 45 b (Austria). Machine for binding straw, hay, etc.
- 59 400, 45 b (Austria). Apparatus for lowering the sheaves, in reapers.
- 59 792,2 c (Switzerland). Cutting apparatus for mowers and reapers.
- 451 537 (France). Reaper.
- 2854 (England). Mowing machine.
- 1056 122 (United States). Mower attachment.
- 259 386, 45 c (Germany). Mower with vertically adjustable finger disk and horizontally revolving knives and carrier arms.

59 412, 45 b (Austria). Potato lifter, hay tedder or swath turner with throw wheel, the teeth of which are driven by planet gearing with centre wheel mounted on elastic supports.

59 474, 45 b (Austria). Potato lifter with apparatus for depositing crop.

59 558, 2 c (Switzerland). Drum hay tedder with excentric gearing for the tine shafts.

451 673 (France). Hay rake.

1 056 665 (United States). Grain harvester.

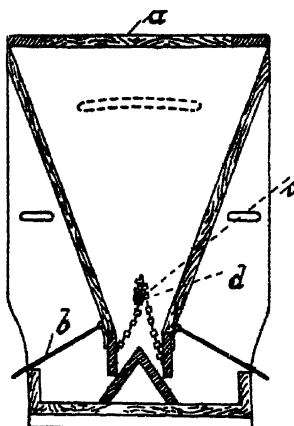
59 266, 45 b (Austria). Apparatus for cleaning seeds and the like, with endless screens placed over each other

59 535, 45 b (Austria). Straw elevator.

# BUILDING- CONSTRUCTION

732 - **Helm's Automatic Feeder** (1). — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 33, p. 218. Berlin, March 19, 1913.

With the apparatus shown in the annexed figure there is no danger that the pigs can soil their food. The feeding troughs are closed on both sides by iron covers (b) which have to be raised by the pigs when they take their



food; (a) is a moveable cover; (c) the adjusting lever, and (d) the shaft with chains for moving the boards. This automatic feeder is refilled every five days with the required amount of food.

733 - **An Apparatus for Drying Cotton.** — *The Agricultural News*, Vol. XI, No. 278 p. 403. Barbados, December 21, 1912.

The accompanying photographs (1) show a new apparatus for cotton drying, which differs in its system from those hitherto used for the purpose in St. Vincent by its simplicity and the ease by which drying operations can be effected even during wet weather. The system was devised by Mr. C. O. Hazell, of St. Vincent and comprises a drying rack on wheels. The cars can be moved easily; their length is 13 ft., their width 3 ft. 7 in., and their height 8 ft. 4 in. They hold seven trays each 5 inches deep running the whole

(1) For experiments in feeding with automatic distributors see No. 1606, B. Dec. 1912; No. 283, B. March 1913; and No. 715 above. (Ed.).

(1) These were kindly placed at our disposal by Mr. W. N. Sands. (Ed.).



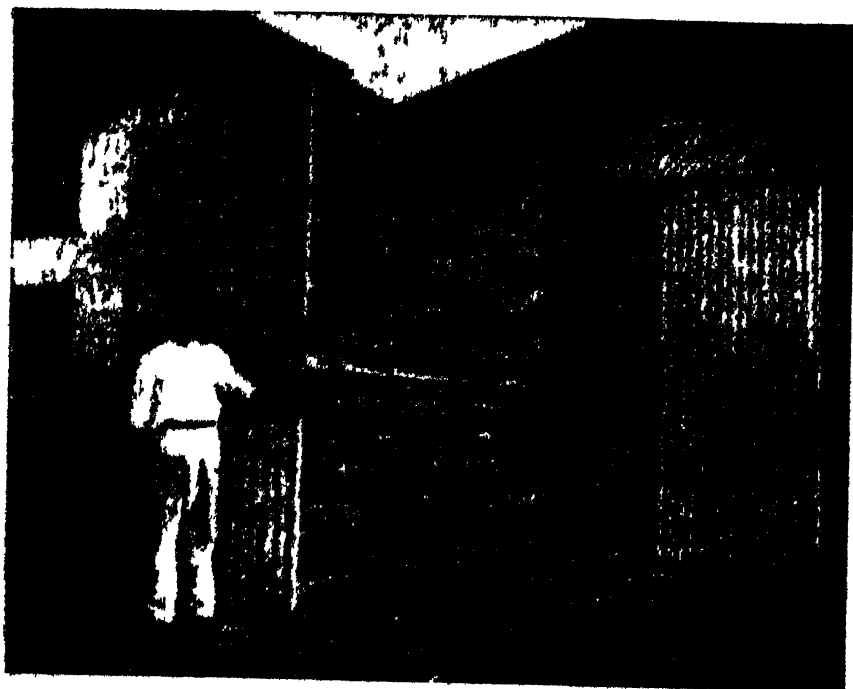
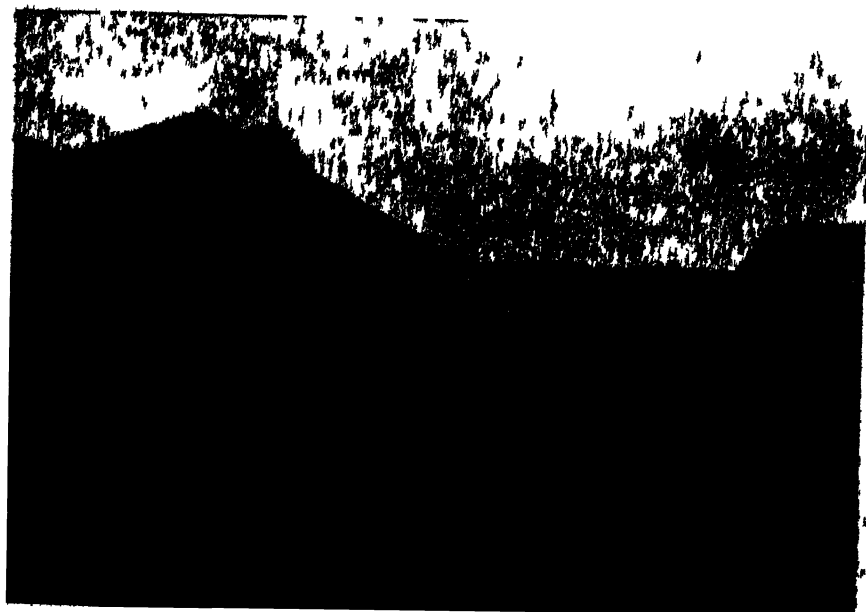


Fig. 1



length and width of the car; the bottoms of the tray are made of  $\frac{1}{4}$  inch galvanized wire netting, so that the air passes easily through the cotton. As the cars run on rails both inside and outside of the drying house, moving them requires little labour. When the cars are inside the house, the cotton is protected from the weather by the device of covering the outside end of each leading car with galvanized iron sheeting, which exactly fits the exit space in the wall when the car is pushed home.

Fig. 1. shows the car when drawn out, while fig. 2 gives the whole apparatus.

## RURAL ECONOMICS.

734 - **The Installation and Accounts of a Large English Dairy Farm.** — The Production of Clean Milk on Two Large Dairy Farms. — *The Journal of the Board of Agriculture*, Vol. 19, No. 11, pp. 923-928. London, February, 1913.

RURAL  
ECONOMICS

The Kelmscott herd of pure-bred dairy Short-horns is said to be the largest in the country, and the system on which it is kept is admirable. The owners farm an area of 2144 acres in contiguous holdings in Oxfordshire, Gloucestershire and Wiltshire. Over 200 cows are kept, and the milk is sent daily to London. In 1909, all cows and heifers in milk were tested for tuberculosis, and since that year the stock has been tested annually. So far only eight animals have reacted and six of these were stock not bred at Kelmscott. No cow that reacts is allowed to contribute to the milk supply. In order to ensure the purity of the milk great care is taken that the hands and clothes of the milkers should be scrupulously clean. During most of the year, the cows are groomed before milking and the udders washed. The tails, udders and hind quarters are kept clipped; and the cowhouses are clean and well-ventilated.

The milk is not pasteurized, but simply cooled to 58° F. Although many milking machines are in use on the surrounding farms, they have not been adopted at Kelmscott, where all the milking is done by hand.

The wages are relatively high; Messrs. Hobbs pay a day labourer from Oct. 1 to Sept. 30, 15s 4d without cottage) the average weekly wages of an Oxfordshire labourer are 13s, or with harvest money, cottage (if provided), extras, etc., 16s 4d; an under-carter's wages at Kelmscott are 17s 0  $\frac{1}{2}$  d, including lodging at 1s per week, a head-shepherd's 26s 2d reckoning 1s 6d a week for cottage and garden. The men's cottages are of an exceptionally good class; the total number of the staff is 102.

The rations fed to the cows vary greatly according to the value of the different feeding stuffs but the following tables indicate average feed :

### Winter

- 3 lbs. dried grains,
- 3 lbs. mixed bean meal and oat meal,
- 3 lbs. cotton, soya bean and dairy cake mixed,
- 9 lbs. per day for thirty weeks.

*Summer.*

- 2 lbs. cotton cake,
- 1 lbs. soya bean cake,
- 1 lbs. dairy cake,
- 4 lbs. per day so long as the animal gives 2 gals. daily.

The average milk yield per cow for the three years ending September 30, 1911, was for 134 cows 6015 lbs., this being the lowest average for many years owing to the summer drought. The average yield per cow for 1910 was 6330 lbs, and for 1909, 6500 lbs. The average yield of an average farm cow in Great Britain is perhaps 4500 lbs.

\* The average yearly expenditure of recent years has been £13 096 6s 10d. Messrs. Hobbs have made the following estimate of the cost of a herd of 40 dairy cows kept on their system.

*Estimated Cost of Herd of 40 Dairy Cows.*

<i>Food.</i>	£	s	d
Grazing, 1 1/4 acres per cow = 50 acres at 30s . . . . .	75	0	0
Rates at 2/6 in £ . . . . .	9	7	6
After feed, 1 1/4 acres per cow = 50 acres at 6s. . . . .	15	0	0
1 1/4 tons hay = 50 tons at 40s . . . . .	100	0	0
56 lbs. mangolds per day per cow for 210 days = 5 1/4 tons			
× 40 = 210 tons at 5s . . . . .	52	10	0
6d per cow per day feeding stuffs, 210 days £5 5s 0d			
2 1/2 " " " 90 " £20 18s 9d			
	£6 3s 9d × 40 = 247 10 0		

*Attendance.*

Thirty weeks, winter . . . . .	99	0	0
Fourteen weeks, summer . . . . .	29	8	0
Milk cart, horse and driver. . . . .	40	0	0
Depreciation in value of cow per year, £1 . . . . .	40	0	0
Losses in death, abortion and veterinary expenses. . . . .	40	0	0
Expense of bull 5s per cow . . . . .	10	0	0
Up keep of dairy utensils 5s . . . . .	10	0	0
Total . . . £	767	15	6
Per cow . . . £	19	3	10
Produce per cow: 600 gall. milk at 8d . . . . .	20	0	0
Value of calf . . . . .	2	10	0
	£	19	3 10
Balance (gross profit) . . . £	3	6	2
To Railway Company: carriage of milk, 600 gallons at 1d per gallon . . . . .	2	10	0
Net profit per cow . . .	0	16	2

735 - "The Evesham Custom."— *The Gardener's Chronicle*, Vol. LIII, No. 1367, pp. 156-157. London, March 8, 1913.

More than 10 000 acres of land in the neighbourhood of Evesham are occupied by market gardens, which are, with few exceptions, leased to tenants. The great extension and the flourishing condition of this intensive cultivation are due, in addition to other circumstances, to the system of tenure obtaining in that district. This system, entitled the Evesham Custom, allows the tenant to pass his lease on to a third party, on payment of a sum as compensation for improvements to the ground and the expenses incurred in planting; the new tenant, with the consent of the owner, takes over the land on the same conditions as the former tenant.

The tenant is thus able to give up, at any season of the year, and wherever he wishes, the whole, or a portion, of his land to another tenant and incurs no risk by so doing.

He is also empowered to hand over part of the market garden to his grown-up sons, as soon as they are capable of managing the business.

Owing to the short period of time which elapses between the giving of the notice to quit and the incoming of the new tenant, it is impossible for the old tenant to exhaust the land and thus decrease its value. Further, even if he had a longer time at his disposal, it would be to his own interest to keep the market garden in the best possible condition, for the compensation which he receives at the close of his tenancy is based upon the condition of the land at that time.

The owner of the land is thus relieved of the necessity of compensating the outgoing tenant for improvements or planting; and is saved the cost and frequent litigation entailed by the often difficult matter of valuation. This system also greatly diminishes the risk of not finding a new tenant within a given time.

The writer gives a brief summary of the provisions of the "Market Gardeners' Compensation Acts".

736 - **Reorganisation of Agricultural Land Tenure in Russia.** — HITTER, H. *Progrès de l'Agriculture russe.* — *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, No. 1, pp. 133-146. Paris, January 1913.

The Imperial Decree of February 19, 1861, had given the rural population as perpetual holding 294 150 000 acres of land; of this quantity 242 875 000 acres was the property of the communes, and 51 275 000 acres consisted of family hereditary holdings. In no case were the grants of land made to individual farmers, but always to the commune, which had then to distribute the land among the various families.

In this distribution the land was classified according to its quality and to its distance from the village, and from each class a plot was given to each villager to cultivate. At every new redistribution of the land rendered necessary by the growth of population, the number of classes was increased; this naturally gave rise to an ever increasing subdivision of the land with all its attendant evils.

On March 30, 1905, the Czar of Russia appointed a special commission for the object of discussing and proposing measures intended to convert

the collective property of the communes into private property of the peasants. An Imperial Decree of November 3, 1905 exonerated the peasants from the payment of arrears after January 1, 1907, for the purchase of land.

The same decree authorised the Peasant's Bank founded in 1882 to advance peasants up to 90 per cent. of the value of their properties at an amortization interest of  $4\frac{1}{2}$  per cent. for  $55\frac{1}{2}$  years. In August 1906 this Bank was entrusted with the task of selling about 5 000 000 acres of crown lands to the peasants. A further decree of October 5, 1908, permitted peasants to possess land in different communes. Lastly the law of June 14, 1910 recognized the right of every peasant to become proprietor of his share of the communal property, and every commune obtained the right of converting the whole of its property into private properties.

In order to carry out in practice the new organization of landed property, the Central Committee for Agricultural Organisation was instituted, to train the necessary local authorities and to guide them in their work. These local authorities were appointed by Decree of March 4, 1906 under the name of Agricultural Commissions, in the various governments and districts. They were composed of Government officials and of representatives of the *Zemstvos*, the nobility and the peasantry. At present upwards of 6000 persons are working on the commissions in 47 governments. The surveyors engaged in the division of lands number 2730, with 2722 assistant surveyors. Between 1907 and 1911, 90690 communes sent in to the agricultural commission their request for the reorganization of the conditions of land tenure, and the surveys of 29 080 000 acres in 30431 communes have been made.

In the reorganisation of the landed property a distinction has to be made between the individual and the collective agricultural reorganisation. The former deals with the total abolition of collective ownership and its transformation into private property, uniting the several plots belonging to one owner; the latter proposes only to diminish somewhat the evils arising from a too minute subdivision of collective property by creating new hamlets on outlying lands and by dividing the communes consisting of several villages into several independent communes. Since 1907 the number of small independent landownness has increased by 654 550. For the reorganisation of collective properties, which is only a transitory step towards the creation of private property, the plans referring to 7 450 314 acres of land have been approved by the inhabitants of the communes concerned.

Since 1906 the agricultural commissions have rented out 12 229 279 acres of State lands as small farms, and sold 887 851 acres to 57 293 peasants. The Peasant's Bank has bought, through the agency of the Commission, 13 981 544 acres of land from the large landowners with the object of selling them again as small farms. In order to facilitate the purchase of such farms by the peasants, the State grants them loans up to 150 rubles ( $\$15\ 17s\ 6d$ ), repayable in 10 years without interest, and subsidies up to 100 rubles ( $\$10\ 11s\ 8d$ ). Up to January 1, 1912, the Commission had granted

the peasantry 147 670 such loans, amounting to £1 423 659, and 32 100 subsidies amounting to £91 498.

737 - **Loss of Area due to Setting out Roads and Ditches in the Rearrangement of Properties.** — KESSLER in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*, Year 14, No. 16, pp. 284-286; No. 17, pp. 297-299; No. 18, pp. 315-316. Bonn, April and May 1913.

After a short review of the origin of the parcelling of fields and of the consequent servitude called in Germany "Flurzwang" (1) on the object and importance of the rearrangement of fields and the creation of a new network of roads, the writer combats the opinion that through the making of new roads and ditches too much land would be lost for agricultural purposes. He calculates, on the basis of the plans for the rearrangement of properties in the districts of Trefenbach, Kraftsolms, Ebersgöns and Hörnsheim, the amount of land which the setting out of new roads and ditches would take from the land at present utilized.

In this calculation he assumes that the injury caused by the excessive division of the fields is equivalent to the loss of a strip 18 inches wide for every plot of arable land and to one 10 inches wide for every plot of meadow; this loss is caused by the boundary furrow not being utilized, by the lower yield of the boundaries owing to imperfect manuring and to stagnation of water, and by the area occupied by the temporary roads. Considering the advantages of the new plans (Establishment of boundary stones, straight boundary furrows, careful and uniform manuring and tilling, abolition of temporary roads), the breadth of the boundary furrow of the new arable fields and of the meadows is reduced by 2 inches.

The plots of large proprietors or of associations, which, on account of their various sizes, would interfere with the formation of a just average, have been omitted from the calculation. The writer, however, includes in it the area required for the drainage and smaller irrigation ditches, notwithstanding the fact that the value of these areas is abundantly recouped by the adjoining meadow plots owing to the improvement due to the making of the ditches (See table).

The table shows that the area required for the new roads and ditches is almost exclusively supplied by the unutilized old boundaries. The three districts of Tiefenbach, Kraftsolms and Ebersgöns are situated in a very uneven region, and require a close network of roads that occupy a good deal of space, while Hörnsheim lies on flat land; consequently results are more favourable here than in the other districts.

Naturally the result is always much influenced by the greater or less subdivision of the fields, or in other words by the greater or less extent of rearrangement that has to be done. In view of further subdivision among co-heirs, the larger plans were divided in this rearrangement into smaller ones not exceeding an average of half an acre in extent; and as a basis

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(1) "Flurzwang" is that servitude which, owing to the division of properties, obliges all owners to cultivate the same crops as their neighbours.

## Tiefenbach

Number of plots before the rearrangement . . . . .	7 746
Total area of these plots . . . . .	904.4 acres
Area occupied by the old roads and ditches . . . . .	39 acres
Area occupied by the new roads and ditches . . . . .	105.3 acres
Excess of area required by the new roads and ditches . . . . .	66.2 acres
Above excess in percentage of total area . . . . .	7.3 %
Number and area of plots belonging to large proprietors, associations, etc.	646—194.7 acres
Area occupied by roads and ditches in above plots . . . . .	14.3 acres
Area remaining for the other plots . . . . .	51.9 acres
Number and area of old cultivated plots, not including above plots . .	4 930—555.1 acres
Average area of plots . . . . .	0.114 acre
Average length . . . . .	295.2 ft.
Average breadth . . . . .	16.4 ft.
Number and area of old meadow plots not including above plots . .	2 170—143.3 acres
Average area of plots . . . . .	0.067 acre
Average length . . . . .	131.2 ft.
Average breadth . . . . .	22.0 ft.
arable land . . . . .	(295.2 ft. + 16.4 ft.) × 17.7 in. × 4 930 = 52.1 acres
Unutilized area    } meadow land . . . . .	(131.2 ft. + 22 ft.) × 9.8 in. × 2 170 = 6.2 acres
} total . . . . .	52.1 + 6.2 = 58.3 acres
Number of new arable plots . . . . .	1 080
Average length of new arable plots (x) . . . . .	360.8 ft.
Number of new meadow plots . . . . .	370
Average length of new meadow plots (x) . . . . .	328 ft.
Unutilized area    } arable land . . . . .	360.8 ft. × 15.7 in. × 1 080 = 11.86 ac.
} meadow land . . . . .	328 ft. × 7.9 in. × 370 = 1.83 ac.
} total . . . . .	11.86 + 1.83 = 13.69 acres
Of the old unutilized area there remains thus for roads and ditches . .	44.6 acres
Extent still required . . . . .	7.3 acres
Percentage of area subject to contribution . . . . .	1.05 %

(x) In the new plots there is no boundary strip left against the roads.

Kraftsölms	Ebersögns	Hörsheim
7800	7100	6256
983.5 acres	897 acres	1205 acres
368 acres	32.1 acres	33.4 acres
85.5 acres	88.9 acres	897 acres
70.9 acres	56.3 acres	56.3 acres
7.2 %	6.34 %	4.7 %
1050—267.4 acres	260—168 acres	806—103.8 acres
19.3 acres	10.6 acres	4.94 acres
51.7 acres	46.2 acres	51.4 acres
4440—538.7 acres	5100—543.6 acres	4550—914.3 acres
0.121 acre	0.106 acre	0.203 acre
328 ft.	278.8 ft.	360.8 ft.
16.1 ft.	16.4 ft.	24.6 ft.
2310—143.3 acres	1740—143.3 acres	900—131.20 acres
0.062 acre	0.082 acre	0.104 acre
98.8 ft.	196.8 ft.	190.8 ft.
20.3 ft.	18.0 ft.	22.9 ft.
(328 ft. + 16.4 ft.) × 17.7 in. × 4440 = 51.9 acres	(278.8 ft. + 16.4 ft.) × 17.7 in. × 5100 = 51.05 acres	(360.8 ft. + 24.6 ft.) × 17.7 in. × 4550 = 59.31 acres
(131.2 ft. + 19.7 ft.) × 9.8 in. × 2310 = 6.42 acres	(196.8 ft. + 18 ft.) × 9.8 in. × 1740 = 6.99 acres	(190.8 ft. + 22.9 ft.) × 9.8 in. × 900 = 3.71 acres
51.9 + 6.4 = 58.3 acres	51.05 + 6.99 = 58.02	59.31 + 3.71 = 63.02 acres
820	1210	1140
393.6 ft.	393.6 ft.	426.4 ft.
350	480	280
261.4 ft.	295.2 ft.	328 ft.
393.6 ft. × 15.7 in. × 820 = 9.74 ac.	393.6 ft. × 15.7 in. × 1210 = 14.33 ac.	426.4 ft. × 15.7 in. × 1140 = 14.58 ac.
262.4 ft. × 7.9 in. × 350 = 1.38 ac.	295.2 ft. × 7.9 in. × 480 = 2.13 ac.	328 ft. × 7.9 in. × 280 = 1.38 ac.
9.74 + 1.38 = 11.12 acres	14.33 + 2.13 = 16.46 acres	14.58 + 1.38 = 15.96 acres
47.2 acres	41.56 acres	47.05 acres
4.45 acres	4.65 acres	4.35 acres
0.65 %	0.68 %	0.37 %

for the calculation of the area required for roads, instead of the number of large plots, the number of the smaller ones was taken. By this means the objection that owing to future divisions of property among inheritors further boundaries will become necessary and thus diminish the favourable results obtained, cannot be raised.

- 738 - **A Model Improvement with Rounding-up of Holdings in the Tyrol.** — ZAILER, VIKTOR in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 32, pp. 384 and 385. Vienna, April 19, 1913.

A description of the cultivation conditions of a fen before and after improvement and the rounding-up of the holdings. Cost of drainage and of laying down new pastures. Map of the district before and after the re-arrangement.

- 739 - **The Share System in the Italian Province of Aquila (Abruzzi).** — CRISCI, POMPILIO in *L'Agricoltura Italiana*, Series 4, Year 9, Part 6, pp. 166-169. Pisa, March 31, 1913.

The writer deals with the Share System contracts obtaining in the province of Aquila: length of lease and terms of notice; the sharing of the fixed and circulating capital and of the produce between the lessor and the lessee, the obligations of the lessee and the grants made by the lessor.

- 740 - **A Joint Labour and Tariff Contract between the Proprietor and his Labourers.** — ZEISSNER, H. K. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 29, pp. 351-353. Vienna, April 9, 1913.

The importance of the joint contract and its suitability to the requirements of farm management. Example of such a contract, which deals chiefly with the following matters: relations between landowner and the labourer's representative, the management by a labourer's committee of the labourers' savingsbank and benefit club (tariff of fines), the division of the labourers into classes, the permanence of their posts, obligation to work, the fixing of the wages and their amount.

- 741 - **Cost of Harvesting in 1911 and 1912.** — GIRARD, HENRY in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year XII, No. 4, pp. 553-557 Paris, December 1912.

A comparison between the cost of harvesting wheat and oats harvests in 1911 and 1912 on the Bertrandfosse estate at Plailly, France.

Final data (per acre):

	1911			1912		
	£	s	d	£	s	d
Cost of reaping by hand and binding . . . . .	—	14	8½	—	13	6
Cost of machine reaping . . . . .	—	9	2	—	9	7
Carting expenses . . . . .	—	14	8	—	15	2
Average general expenses . . . . .	1	5	1	1	5	3

- 742 - **The Cultivation of Small Holdings in the Department of Ardèche in France.** — HIRIER in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, No. 1, pp. 90-113. Paris, January 1913.

A description of about 10 well-managed small holdings of from 5 to 20 acres in extent, situated on the rocky eastern slopes of the Cévennes. Chief industries practised: silkworm-rearing, cultivation of vines and fruit trees (peaches, plums, figs, cherries), and market gardening.

## AGRICULTURAL INDUSTRIES.

- 743 - **New Method of Freeing Milk from Germs.** — LOEBCK, O. in *Molkeret-Zeitung*, Year 23, No. 11, pp. 117-158. Berlin, April 5, 1913.

The writer points out the disadvantages of pasteurizing and sterilizing milk and describes a new method of freeing the latter from micro-organisms. This consists in pouring the milk from the pails into a pressure chamber, where it is subjected by a pump to a pressure of 4 atmospheres, then heating it as a fine spray indirectly for some seconds in a sterilizer at a temperature of 73 to 75° C. (163 to 167° F.), and immediately cooling it. The advantage of this method over those hitherto employed consists in the fact that the pathogenic milk flora is thereby destroyed without the milk having undergone any change, as far as chemical tests show. It retains the properties of raw milk and can be used for cheese-making. Milk so treated keeps twice as long as fresh milk, and on coagulation there is but little difference in the taste.

- 744 - **The Manufacture of Butter for Storage.** — ROGERS, L. A., THOMPSON, S. C. and KEITHLEY, J. R. U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 148, pp. 27. Washington, 1912.

The long annual period of low production of butter in the United States has made it necessary, in order to ensure a fairly uniform supply, to store large quantities during the short season when the production exceeds the demand, which is in the spring and early summer months. In May, June and the early part of July there is active buying for storage. This season is followed by a few months in which the supply and the demand are nearly equal, while in the winter there is a decided scarcity of fresh butter. Butter may be held in storage from May to April, a period of 11 months, although the average time is probably only 8 or 9 months. Under exceptional conditions, dealers may have kept butter over a year, but this is usually done at a heavy loss.

An insignificant quantity is kept in small towns in refrigerators, mainly by an ice-salt system at 20°-25° F., but the bulk of storage butter is in the great trade centres in large warehouses at temperatures of 0° F. and below.

All butter changes slowly in storage, even at temperature as low as -10° F., the waxy texture of the fresh butter changing to a pasty consistency. This is not evident, however, except on very long storage, and is not a fac-

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tor in commercial storage. The most common alteration is in the flavour, which sometimes becomes so objectionable as to materially lessen the market value of the product. The cause of this change has not been determined with any certainty, but it is not due to the temperature, as it occurs in butter kept at higher temperatures. The most common alteration is the occurrence of the so-called "storage flavour"; this only appears in old butter. Fishy flavour may be found in butter originally of the highest quality and much detracts from its market value.

Though the exact cause of these flavours has not been discovered, certain factors which may influence or accelerate their development have been pointed out in previous publications of the Dairy Division. The importance of the acidity of the cream at the time of churning, and the possibility of making butter of superior keeping quality by limiting the acidity has been especially emphasized in the latter. It was observed in the examination of 259 samples of experimental butter of known acidity, that of 137 samples from cream having an acidity of below 0.3 per cent., only 2, *i. e.* 1.5 per cent., were marked fishy; while of 122 samples having an acidity of 0.3 per cent. or over, 60, or 49.20 per cent., were fishy.

The probable nature of the relation of acidity to change in flavour has been discussed in previous bulletins of the Washington Bureau of Animal Industry. It is evident that, to make butter of good keeping quality, any treatment that increases the chemical instability of the product should be avoided. Butter of good quality can be made from sweet pasteurized cream and the deteriorating influence of the acid is thus eliminated.

Advantage has been taken of this fact by the Navy Department of the United States, which has found it expedient for several years to procure and store a year's supply of butter during the period of heavy production. The butter was made from pasteurized sweet cream and packed in hermetically sealed tin cans under the supervision of, and according to specifications prepared by, the Dairy Division of the Department of Agriculture.

The Navy butter for 1909, 1910, and 1911 kept excellently and proved the efficiency of the methods used in making and packing it.

The scoring of samples of butter contained in three series of cans and preserved in a similar manner for 8 months in 1909, 1910, and 1911 was as follows:

TABLE I.

Year	Average original score	Average score after storing	Average points lost in storage
1909 . . . . .	94.92	90.90	4.02
1910 . . . . .	94.73	91.75	2.98
1911 . . . . .	94.75	92.37	2.38

One creamery was permitted, by special contract, to disregard the acidity and pasteurization requirements of the specifications and to increase the water content to 15.5 per cent. on a guarantee that the butter would score 90 after being held in storage for 8 months. This butter was made from unpasteurized cream and an acidity of about 0.56 per cent was developed; the methods of packing, shipping and storing were the same as at other creameries having contracts for Navy butter. On comparing this result with the results obtained by the creameries working under the prescribed precautions and taking one which represents medium conditions, we find a difference of only 0.49 points in the score at the time of packing, while after being held in storage the difference amounts to 5.08 in favour of the butter made from pasteurized sweet cream.

Other experiments were made in 1910 in three creameries in the vicinity of Owatonna, Minn., in order to demonstrate the feasibility of butter dealers having butter made expressly for storage. The three creameries adopted different methods: *A* made butter from unpasteurized ripened cream; *B* pasteurized the cream, added a starter and ripened the cream in the usual way; *C* pasteurized the cream, cooled it at once and used no starter. The results, which are given in the following table, show the latter method to have been the most satisfactory.

TABLE II.

Character of cream	Number of churnings	Average score of fresh butter	Storage temperature °F.	Number of tubs scored	Average score after storage
Raw ripened cream . . . . .	18	92.33	0	18	87.33
			10	18	86.94
			20	12	86.33
Pasteurized ripened cream . .	30	93.35	0	30	91.20
			10	30	90.28
			20	17	88.47
Pasteurized unripened cream .	(1) 17	92.94	0	18	92.36
			10	18	91.91
			20	12	91.41

(1) Not including one churning which was not scored before storage.

In 1911, a similar arrangement was made with the same company and butter was made for storage at two creameries, *D* and *E*. Thus three

different systems were followed, and the results were always in favour of using sweet pasteurized cream.

TABLE III.

Character of Cream	Number of churnings	Average score of fresh butter	Storage temperature °F.	Number of tubs scored	Average score after storage
Raw ripened cream . . . . .	21	93.55	0	21	91.86
			10	21	89.48
			20	8	89.88
Pasteurized ripened cream . .	23	93.52	0	23	91.74
			10	23	89.91
			20	11	89.64
Pasteurized unripened cream .	19	94.61	0	19	94.18
			10	19	93.16
			20	8	92.88

The superior keeping quality of sweet cream butter is evident in its uniformity, the slight change from its original condition, and the almost complete absence of the usual cold-storage flavours. This butter was made under conditions which could be duplicated for any dealer requiring butter made expressly for storage.

With regard to the influence of temperature upon butter, it is clear that a low temperature retards the changes in storage butter. A certain stage of deterioration may be reached in three weeks at 32° F, or in three months at 0° F.

The results on various lots of butter show a small difference between butter stored at — 10° F and + 10° F, but a marked difference between butter stored at 10° and 32° F. In the work reported in the present paper, duplicate tubs were stored at 0°, 10° and 20° F. The results due to temperature are well seen in Table IV.

These results show that the deterioration in stored butter is in a general way directly proportional to the temperature of the store and that pasteurized sweet-cream butter keeps relatively well at all temperatures; even at 20° F the latter deteriorates comparatively little.

TABLE IV.

Kind of butter	Points lost after storage		
	Stored at 0° F.	Stored at 10° F.	Stored at 20° F.
Raw Cream butter — Creamery A. . . . .	5.0	5.3	5.8
"    "    "    —    "    D. . . . .	1.7	4.1	3.3
"    "    "    all samples . . . . .	3.2	4.6	4.8
Pasteurized ripened cream — Creamery B. . . . .	2.2	3.0	5.1
"    "    "    —    "    E. . . . .	1.7	3.6	4.0
"    "    "    all samples. . . . .	2.0	3.3	4.6
Pasteurized unripened cream — Creamery C. . . . .	0.6	1.0	1.5
"    "    "    —    "    D. . . . .	0.4	1.0	1.6
"    "    "    all samples. . . . .	0.5	1.0½	1.6

745— The New Warm-Chamber Method of Making "Grana" Cheese (1). — OLIVA, J. A. in *Il Caseificio Moderno*, Year 6, No. 6, p. 85. Piacenza, March 15, 1913

During the last few years, the best-known investigators of the problems relating to cheese-making (Spallanzani, Gorini and Fascetti) have been trying to solve an important question in the manufacture of "Grana" cheese, namely to find a method of preventing the curd swelling without the loss of its characteristic appearance and flavour. The idea followed was to regulate the fermentation taking place during ripening; to this end the selected ferments of Professors Gorini and Fascetti have come into use and into the trade. These ferments, if used according to the instructions given by their preparers, have the property of hindering the development of the injurious ferments which affect the milk before and during the making of the cheese.

The new method has been proposed by Prof. Samarani of the Royal Cheese-Making Experiment Station at Lodi; it consists in promoting the development of selected ferments through the action of a warm chamber, thus giving them an absolute predominance in the fermentation process.

The method is practised as follows:

1) The filtered milk is cooled in a refrigerator to a temperature below 18° C. (64 ½° F.), when it is placed in metal basins to let the cream rise; these basins, which must not be of polished copper, are immersed in water, kept always at a temperature below 18° C. By this treatment the milk

(1) See also No. 588, B. May 1913.

(Ed.).

descends into the boiler without any natural fermentation taking place, and it retains its natural acidity unchanged.

2) Before the addition of the rennet, the selected lactic ferments (lactic bacilli) are added to the milk in the proportion of 1 per 1000 by volume; these micro-organisms possess the maximum fermentative power (virulence), obtained by growing them in a suitable sterilized liquid prepared on a basis of peptone and lactose neutralized with carbonate of lime. To ensure vigorous action, fresh ferment should be added regularly, without interruption, at 24 hours interval, and developed at a temperature of 32 to 35°C. (90 to 95°F.). Before each ferment is used the quantity necessary for the succeeding inoculation is set apart in the proportion of 5 per cent.

3) The form, on leaving the boiler, passes into a warm chamber at 37 to 40°C. (99 to 104°F.), the optimum temperature for the development of the bacillus forms of lactic ferments; here it remains for 12 to 14 hours, until the lactic fermentation is complete; this is recognized by the plasticity of the curd.

The experiments undertaken by Prof. Samarani have begun favourably, since about forty forms of Grana, which have been partly made from centrifugated milk, *i. e.* with milk which is difficult to work, have been kept during the summer months without signs of swelling.

Before, however, passing a definite judgment, it is necessary to wait two years longer and then carefully examine the qualities of cheese made according to the new warm-chamber method.

746 — “**Bankrote**” Cheese (1). — TEICHERT, KURT in *Molkerei-Zeitung*, Year 27, No. 26, pp. 489-490, Hildesheim, April 4, 1913.

The writer has of late examined many “bankrote” Emmental and Münster cheeses, and has ascertained that their condition is not due to bacteria. If such cheeses are grated to a powder and the latter is mixed with an alcoholic solution of phloroglucin in hydrochloric acid, a red discoloration is seen. The cheese rinds showed a very strong reaction, which decreased as the centre of the cheese was approached. Cheeses which were not affected gave no red reaction with phloroglucin and hydrochloric acid. The writer, therefore, concludes that the red colour is principally due to the sap of the wood of the shelves having penetrated into the cheeses placed upon them. Cheese-shelves made of white spruce wood imparted the characteristic deep brown-red colour to the cheeses stored upon them.

747 - **The Microflora of Stilton Cheese.** — PERCIVAL, J. and MASON, G. HEATHER, in *The Journal of Agricultural Science*, Vol. V, Part 2, pp. 222-229 + figs. Cambridge, March 1913.

After a description of the methods adopted in the investigations, a detailed account is given of the micro-organisms found in Stilton cheese. The number of these is large in fresh cheese (1 000-3000 million per gram

(1) This epithet is applied to cheeses in which the rind has assumed a brownish-red colour from long storage on damp shelves. The colour is quite distinct from that obtained with the phloroglucin reaction.

in the first week), but there is a gradual fall in the numbers up to the time of ripeness (100 to 150 days old), when 50 to 100 millions only are found.

Five characteristic organisms were found in all Stilton cheeses examined, viz: 1) *Streptococcus lacticus*, 2) a short-rod form of *Bs. acidilactici*, 3) a species of *Tyrosinix*, 4) *Penicillium glaucum*, and 5) a round form of *Torula*, sometimes accompanied or replaced by an oval form.

748 - **The Cattle Market and Cattle Trade at La Villette in 1912** (1). — ROLLIN in *Bulletin des seances de la Société Nationale d'agriculture de France*, Vol. 73, No. 1, pp. 47-54. Paris, 1913.

MEAT  
INDUSTRY

The following tables show the importance of the cattle trade at the La Villette cattle market in 1912, and give the prices as compared with those of the preceding year.

*Number of animals taken to the cattle-market.*

	Cattle	Sheep	Calves	Pigs
1912. . . . .	356 352	1 534 852	183 884	372 417
1911. . . . .	349 458	1 512 213	180 874	405 290
Increase (+) or decrease (—) in 1912 . . . . .	+ 6 894	+ 22 639	+ 3 010	— 32 873

*Number of animals taken direct to the slaughter-houses.*

	Cattle	Sheep	Calves	Pigs
1912. . . . .	79 961	935 141	199 752	338 915
1911. . . . .	79 816	898 607	195 360	284 325
Increase on 1912. . . . .	145	36 534	4 392	54 590

From a table for 1912 given in the original article, it is seen that the prices of first-class cattle are above the average for the year in the months of April, May, June, July and August. The prices are below the average in the last quarter of the year and in January and February. Cattle of the

(1) See Nos. 93 and 180, *B. Feb.* 1913, and No. 594, *B. May* 1913

(Ed.).

*Average, Maximum and Minimum Prices at the La Villette Market.*

Kind	Average Prices				Maximum and Minimum Prices			
	Pence per lb. meat							
	1st Quality		3rd Quality		Highest Price		Lowest Price	
	1912	1911	1912	1911	1912	1911	1912	1911
Cattle . . . . .	7 <sup>3</sup> / <sub>4</sub>	7 <sup>3</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>4</sub>	6	8 <sup>3</sup> / <sub>4</sub>	9	4 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>
Sheep . . . . .	10 <sup>3</sup> / <sub>4</sub>	10 <sup>1</sup> / <sub>2</sub>	8 <sup>1</sup> / <sub>4</sub>	8	11 <sup>3</sup> / <sub>4</sub>	12	6 <sup>1</sup> / <sub>2</sub>	7
Calves . . . . .	10 <sup>1</sup> / <sub>2</sub>	10 <sup>3</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>2</sub>	12 <sup>1</sup> / <sub>2</sub>	12 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>
Pence per lb. live weight								
Pigs . . . . .	6 <sup>1</sup> / <sub>4</sub>	6	5 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>2</sub>	7 <sup>1</sup> / <sub>4</sub>	7	5 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>

third quality fetch higher prices than the annual average in April, May and June, and lower in January, February, September, October and December.

The price of sheep is above the average in February, March, April, August, September, November and December.

The highest price for first-class calves was reached in January, February, March, April and May. Otherwise the price was always below the yearly average. The price fetched by calves of third quality was higher than the yearly average on January and April, and lower in the other months.

The price of pigs was higher from February to September; in the other months it was below the average price.

## WINE-MAKING

749 - **Gold and Ferments in 1912.** — ASTRUC, H. in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1009, pp. 541-545. Paris, April 17, 1913.

It is the firm conviction of the writer, based on his observations in 1913 in the vineyard and upon his laboratory notes, that the alcoholic fermentation of the vintage proceeds badly, or is prevented from taking place at all, when the temperature is below 18 to 20° C. (64 to 68° F.); this is the case even in the south of France, especially when the ferments are all sporulate to begin with, as occurs generally on healthy grapes at the beginning of the season, if the vintage is placed in a recently opened cellar in clean vats, as it always should be.

If it is desired to avoid the difficulties due to low temperature and to obtain the necessary fermentation without having recourse to a must-warmer, which is a costly apparatus as it is seldom used, the writer considers the only economical method is to *initiate fermentation artificially* by adding ferments in full budding, which would give the necessary heat to the liquid. These ferments could, if wished, be obtained from a native must, and their preparation would only entail the early gathering of a

small quantity of grapes, or else the use of pure-culture or selected trade yeasts. The essential point is that they should be very active and bud rapidly; this entails the use of young yeasts and usually necessitates the addition of some starter (*pied de cuve*) made on the premises, or got from a neighbouring starter-establishment (*zymogène*).

Another very important point is to avoid drowning these yeasts in a large quantity of chilly must and thus paralysing their activity. Contrary to what is usually recommended, it is necessary, in years when the temperature is below 20°C. (68° F.) or thereabouts, to throw the starter simply on the surface of the pomace, or the must, without stirring it up; by this means the yeast will lose as little heat as possible and will produce actual centres of fermentation, whence the activity will radiate through the mass.

The must should only be aerated at the time of pressing, and all other customary aerations should, in this case, be avoided. The temperature of the upper third of the liquid alone need be watched, but when this exceeds 32° C. (90° F.) or thereabouts, it can be regulated by mixing in the lower third, avoiding all unnecessary aeration. If, at the same time, the necessary amount of sulphurous acid is reduced to the minimum, and if its hindering effect is corrected by introducing into the vat from 10 to 15 gr. of ammonium phosphate per hectolitre (about 2 ½ oz. per 100 gallons), which is an excellent nutrient salt for yeasts, the best measures have been taken to prevent any deleterious action on the fermentation which might be produced by early cold.

**750 - The Maturation and Clarification of Wines by Means of Cold.** — CARLES. in *Bulletin de la Société des Agriculteurs de France*, p. 274. Paris, April 1, 1913.

The writer has already advocated for some time the use of low temperatures, either natural or artificial, in the maturation of wines. He shows in this article that the effect of the cold can be increased during refrigeration by putting the wine in active motion. This can be done in various ways, e. g. by beating the contents of the vats with a wine-shed broom, rocking the barrels containing the vintage, or by any other practical method.

If a solution of potassium bitartrate in artificially cooled pure water is subjected to similar mechanical action the deposition of the salt is more rapid and more complete. Should it be dissolved in wine, and especially new wine, or a mixture into which new wines enter, the relative amount of tartar deposited is still greater. This is due to two totally different causes, which have, however, the same result.

The first, which is entirely physical, depends on the property of the tartar of removing other substances. New wine is, in fact, a super-saturated solution of tartar. The cold releases this super-saturation and diminishes the capacity of solution, especially if the temperature is very low and the cold is prolonged. When the tartar is thus insoluble in a medium containing substances in a state of unstable equilibrium, or in pseudo-solution, it has the power of combining with them and removing them. This union is known under the name of "laques".

The second case is chiefly chemical. When chilled new wine, in a barrel three-quarters full, is beaten vigorously or when a large surface of the chilled wine is exposed to the air, a certain quantity of oxygen is introduced into it. This oxygen is more soluble in wine near freezing-point than at ordinary temperatures. In dissolving, therefore, it combines by preference with those elements of the wine which are most readily oxidized; of these the blue pigments are the chief. By oxidation these pigments progressively lose their solubility, and thus from being pseudo-soluble they become wholly insoluble. The tartar possesses an especial affinity for these pseudo-soluble substances, which it abstracts from the wine till it itself reaches the equilibrium of saturation. But the reciprocal action is such that it is impossible for these oxidized pigments and ferruginous tannoids, which have individually been rendered insoluble, to separate out from the wine without, in their turn, removing part of the normally dissolved tartar even in the oldest wines.

It is for this reason that the first lees form after racking, which is a simple mechanical process, and that the sediment is so abundant.

The action of cold is thus only apparently physical and can be increased two-fold by the chemical action of the oxygen of the atmosphere, and even more by imparting motion to the wine in different ways.

The first result is, not only the elimination of the tartar and similar acid salts, which are present in excess, but also the removal of all the potentially insoluble compounds forming the blue pigment of new wine. The complex products of this separation form the first lees, and this general precipitation produces a self-clarification of the first order.

Herein lies the secret of the maturation of new wines by means of cold and the general elimination of their pseudo-soluble compounds. The experiment shows that these two processes are followed by a state of equilibrium and stability equal to that possessed by old wines. Further, it demonstrates that if wine kept at this low temperature is frequently racked off, it assumes the extraordinary limpidity and ruby colour so much admired by wine-makers and which is otherwise attained by exposing the product to the long-continued cold of many winters.

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## PLANT DISEASES

### GENERAL INFORMATION.

751 - The Law Respecting the Protection of Plants in Egypt from Imported Diseases. — *Journal Officiel du Gouvernement Égyptien*, Year 40, No. 31, pp. 655-656. March 17, 1913.

On March 11, 1913, the Khedive of Egypt decreed as follows :

LEGISLATIVE  
AND ADMINI-  
STRATIVE  
MEASURES  
FOR THE  
PROTECTION  
OF PLANTS.

Art. 1. — The importation of cotton plants, cotton seed, unginned cotton and the wood of the cotton plant is forbidden. The importation in transit of unginned cotton and of cotton seed is likewise prohibited, unless accompanied by an official certificate testifying to their fumigation in the country whence they are exported.

Art. 2. — The importation of all live insects, as well as of their eggs, larvae and pupae is forbidden. The importation of all cultures of bacteria and of all fungi injurious to plants is also forbidden. The importation of silk worms and of bees is forbidden, except by special permission of the Department of Agriculture, and according to the conditions prescribed by that authority.

Art. 3. — The provisions of the two preceding articles do not apply to cotton plants, cotton seed or insects imported by the Department of Agriculture for scientific purposes.

Art. 4. — Date palms, banana plants, and sugar canes may not be imported except by special permission of the Department of Agriculture and in accordance with the regulations prescribed by the latter.

Art. 5. — Potatoes on their arrival at the Custom House may be subjected to examination ; should they prove to be infected with black scab (*Chrysophlyctis endobiotica*) they will be destroyed, with no compensation to their owners. Should the potatoes be found to be attacked by *Phthorimaea operculella*, they are to be fumigated at the expense of the receiver.

Art. 6. — Live plants imported into the country, and not included in the preceding articles (including the stems, bulbs, roots and all other portions of plants capable of growth, with the exception of seeds), shall be fumigated at the expense of the receiver. Exceptionally, plants arriving by parcel post will be fumigated at the expense of the Government. Trees

and shrubs arriving at ports where there is no fumigating apparatus of sufficient size, will be sent on by sea to Alexandria, Port Said or Suez.

Art. 7. — The Minister of Public Works can, by means of a decree published in the *Journal Officiel*, declare foreign countries infected by diseases, or by fungi injurious to plants, and order the fumigation on their arrival, and at the receiver's expense, of all fruits and seeds mentioned in the decree and coming from these countries, or of unknown origin. All fruits and seeds are likewise subjected to fumigation, which, on examination by the agents of the Department of Agriculture, prove to be infected by a disease or fungus mentioned in this decree.

Art. 8. — All plants and fruits coming from abroad should be packed in such a manner as to facilitate their examination and, if necessary, their fumigation. In default of this the packages are liable to being opened at the risk of the receiver.

Art. 9. — Such parcels as are introduced into the country contrary to the provisions of the law in question must be re-despatched within 15 days, or otherwise they are liable to be destroyed without their owners having any claim for compensation.

Art. 10. — The regulations of the present law shall be enforced at the Custom House by the agents of the Department of Agriculture or by those of the Customs and Postal Services. In the case of boxes arriving overland, these regulations will be carried out by the Department of Agriculture at the first station on Egyptian territory.

Art. 11. — Laws Nos. 10 of 1904 and 21 of 1909 forbidding the importation of cotton seed are abrogated.

Art. 12. — The Ministers of Public Works and of Finance are charged, in so far as it is in their power, to enforce this law, which comes into force 30 days after its publication in the *Journal Officiel*.

752 — Proclamation of March 6, 1913, for the Protection of Bananas in British Honduras. — "The Plant Protection Ordinance 1912", Proclamation No. 1 of 1913, British Honduras.

The importation into the Colony of bananas and plantains and of any seeds, cuttings or plants thereof, or any description of earth or any articles packed therewith or any package, covering or thing in which they may be packed is prohibited except in accordance with the conditions of a special licence given by the Governor on the occasion of each importation.

## DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES  
NOT DUE TO  
PARASITES  
AND OF  
UNKNOWN  
ORIGIN

753 — The "Degeneration" of the Agen Plum. — RABATÉ, E. Le Prunier d'Ente dégénéré. — *Revue de Viticulture*, Year 20, Vol. XXXIX, Nos. 1007 and 1008, pp. 483-489 and 525-530, figs. 71-80. Paris, April 3 and 10, 1913.

For thirty years a special affection of the Agen plum tree (*Prunier d'Ente*, or *Robe de Sergent*) has been recorded. The disease is recogniz-

able by a combination of clearly distinguished external characters and is known as degeneracy, anomaly, deterioration, sterility, male plum, etc. The branches of the affected tree are bare at intervals; the twigs are thick and short, with an almost regular diameter; the leaves are wide and glossy, and grow in tufts; the flowers occur in thick clusters, while the fruits are rounded and very few.

So far the investigations of this disease do not permit of its being attributed to any definite parasite. The writer considers it provisionally as due to great irregularity in the food supply of the tree, especially as regards water.

To avoid this disease spreading in new plantations, the following conditions are necessary: fresh, calcareous, permeable soil; stocks adapted to the soil; scions taken from healthy, strong, productive trees with long leaves and pyriform fruit.

Sowing the stones of Agen plums produces good stocks, and ever new types of this variety without grafting.

Abnormal Agen plum trees, if not too old, may be re-grafted with greengage or other varieties.

No exact results have been obtained by the use of fertilizers, insecticides and fungicides; and certainly new systematic investigations are very necessary.

## BACTERIAL AND FUNGOID DISEASES.

754 - **Chinese Fungi** (1) — MITSUKE, ICEIRO in *The Botanical Magazine*, Vol XXVII, Nos. 314 and 315, pp. 37-44 and 45-54, plate 1. Tokyo, February and March 1913.

This is a new contribution to the mycological flora of China and includes 31 species parasitic on cultivated or other useful plants, collected in 1908 in South China and in 1910 in the neighbourhood of Peking. The following are new to Science: *Uncinula Koelreuteriae* on the leaves of *Koelreuteria bipinnata* Frank; *Phaeosphaeria Eriobotryae* on the leaves of *Eriobotrya japonica* Lindl.; *Melampsora Periplociae* on the leaves of *Periploca* sp.; *Phaeospora Compositarum*, on the leaves and stalks of *Aster* sp. and of *Artemisia* sp.; *Coniothyrium Rhamni*, on the leaves of *Rhamnus* sp.; *Melophia Polygonati*, on the leaves of *Polygonatum officinale* All.; *Marssonina viticola*, on the leaves of *Vitis vinifera* L.; *Cercospora Clerodendri*, on the leaves of *Clerodendron* sp.

755 - **The Barberry and its Relation to Black Rust of Grain.** — Communication from H. T. Gussow (Dominion Botanist, Canada), Experimental Farm, Ottawa, to the International Institute of Agriculture.

Many years before the distinguished Mycologist, Anton de Bary, of the University of Strassburg, had shown by scientific investigation (in 1865)

(1) See No 1099, B. July 1912.

(EJ).

that the barberry (*Berberis vulgaris* L.) played an important role in the spreading of black rust of grain (*Puccinia graminis*), practical farmers in the Continent of Europe were convinced that the rust specks on the barberry had some connection with the grain rust. Naturally the interpretations of this observation were merely fantastic. Within recent years, and as the knowledge of the life history of these destructive grain parasites advanced, the fact that barberry rust and grain rust were closely related became more and more established. It was clearly proven that the barberry served as an intermediate host for the fungus on grain. However, there has been entertained considerable doubt or lack of appreciation as to the correctness or practical use of this observation, which was regarded as a mere theory. It was pointed out by several other investigators that in certain districts of Hungary and Sweden very few barberry bushes existed, and still black rust seemed to persist. Dr. Barclay, the pioneer Indian mycologist, cited a particularly interesting example, referring to the grain growing districts of the East Indies where there is no barberry to be found within 300 miles of that area. However, beyond this distance in the mountainous regions there were barberry bushes growing. We may note that although in these cases "there were hardly any barberries left" or "they were 300 miles away from the grain growing district" yet there certainly existed some barberries all the time. One of the first European countries which took the matter seriously was Denmark. By means of an Act this country enforced the systematic destruction of the barberry. It has been stated by Dr. Lindau (in 1908) that notwithstanding the destruction of the barberry, black rust of grain continued its devastations, although the intensity of the infection varied to some extent. This latter observation, of course, may be commonly made any one year, the rust varying considerably according to districts or climatic conditions.

In the report of the Dominion Botanist for 1911, p. 239, the present status of our knowledge of rusts was briefly summarized, and it was stated: that it had been found in Denmark, for instance, that the compulsory destruction of barberry has not brought a reduction in the severity of rusts. This statement was eventually read in Denmark, and we are indebted to Dr. J. Lind of the Phytopathological Experimental Station, Lyngby, Denmark, for a letter in which he refers to this statement explaining that: "*Puccinia graminis* is quite perceptibly disappearing in Denmark year by year to the same degree as we get rid of the *Berberis*, and we are very satisfied with the results of the *Berberis* Act."

This communication contained important information of a more definite character than any we had been able to secure previously. We thought it, however, desirable to seek the opinion of another Danish plant pathologist and communicated with Dr. F. Kölpin Ravn of the Pathological Museum of Copenhagen. He very courteously writes us under date March 26th:

"In your letter of February 27th you desire to know what my personal experience has been concerning the extermination of barberry bushes in this country. I have been able very often to observe early outbreaks of *Puccinia graminis* on rye and oats; in all such cases - without any exception -

we have been able to find some barberry bushes near by ; and some years after the removal of these bushes these early outbreaks of rust had disappeared.

"Several of the local advisers in Plant Culture carried on a systematic fight against the barberry bushes, as required under the Act. And at present the early - and only dangerous - outbreaks of black rust are rarely reported. I may add that the farmers practise for some recent years sowing spring grain earlier than before, which further helps in the fight against the rust. I think, therefore, that the present very slight infections by *Puccinia graminis* are the result of the two named factors taken together."

From these two letters it would appear that the systematic destruction of the barberry, green and purple leaved - for the aecidia of the rust fungus occur on both - would produce a very desirable effect, i. e., the checking of the severity at any rate of that most dangerous rust of grain culture.

The barberry shrub, it must be realized, is worthless as compared with the immense value of cultivated grain. In order to protect the grain industry as much as possible, the destruction of the barberry wherever it grows is strongly advocated.

756 - **Spraying Fruit Trees with Lime-Sulphur Wash** (1). — MARRE, E. in *Le Progrès agricole et viticole*, Year 30, No. 17, pp. 529-532. Montpellier, April 27, 1913.

MEANS OF  
PREVENTION  
AND CONTROL

From the results of a second year's experiment as to the efficacy of lime-sulphur wash against the diseases of fruit trees (peach, apple, pear) the writer recommends this wash as a successful means of controlling leaf-curl of peaches (*Exoascus deformans*) and applescab (*Venturia inaequalis*).

In order to obtain good results, the mixture must be applied three times: a) just before flowering; b) when the blooms are falling; c) three weeks later.

757 - ***Bacillus Capsici* n. sp., causing Shrivelling of Capsicum** — PAVARINO, L. and TURCONT, M. Sull'avvizzimento delle piante di *Capsicum annuum* L. — *Atti dell'Istituto Botanico dell'Università di Pavia*, Series II, Vol. XV, pp. 207-211. Milan, 1913.

BACTERIAL  
AND FUNGOID  
DISEASES  
OF VARIOUS  
CROPS

In 1912, the cryptogamic Laboratory of Pavia received stems of capsicums from Bergamo and Treviglio (Province of Bergamo), and also from Tortona (Province of Alessandria), which were more or less affected by a disease described previously as wilting or disease of capsicums by Montemartini (1907), and as capsicum rot by Noelli (1910). The former attributed the disease to *Fusarium vasinfectum*.

On examining the material sent, the writers also discovered a *Fusarium*, but as this only appeared on parts of the roots which were eaten away and dead, they do not consider that this fungus is the cause of the disease. They rather attribute it to the presence in the cells of the affected tissues of a micro-organism which they isolated and which cannot be confused with *Bacterium Solanacearum* Smith. They describe the parasite and name it *Bacillus Capsici*.

(1) See No. 423, B. Feb. 1912, and also No. 72, B. Jan. 1913 and No 317, B. March 1913. (Ed.).

## PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC  
AND OTHER  
INJURIOUS  
FLOWERING  
PLANTS

758 - A Contribution to the Control of Dodder. Destruction of the Seeds. — BRESAOLA, M. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 89-136, plates V-VII. Modena, 1913.

According to the researches of the writer, the seeds of *Cuscuta arvensis* and of *C. Trifolii* (1) are certainly more susceptible to heat than those of the chief leguminous meadow plants (lucerne, red clover, Dutch clover and bird's-foot trefoil). After dry heating, the seeds of *C. Trifolii* and *C. arvensis* largely lose their powers of germination. After being heated to the maximum temperature endured by leguminous seeds, a certain number of the hard dodder seeds remain unhurt; the number is relatively high in the case of *C. Trifolii* and very small in that of *C. arvensis*. The following temperatures have proved most efficacious: 65° C. (149° F.) for two hours; 70° C. (158° F.) for 30 minutes; 70° C. (158° F.) for one hour; 75° C. (167° F.) for 30 minutes; 75° C. (167° F.) for one hour. Further experiment is needed to find out which is the best. The length of the heating had more effect upon *C. Trifolii* than the height of the temperature. Seeds of Leguminosae, when exposed dry to these temperatures, are not harmed; in fact, their germination capacity and energy were increased. Dry heating of hard seeds of Leguminosae has thus a favourable effect upon their germination.

The writer further observed that *C. arvensis* does much less harm to crops than *C. Trifolii*, and that the injury due to the former is less than is supposed, for which reason the restrictions placed upon the seed trade by some States appear to be unnecessarily stringent. Only a very severe attack of *C. arvensis* can cause the destruction of a crop, and even if leas are badly infested the pest tends to die out; thus, though the first cut may be lost, the second and third, especially the latter, are usually saved. The attacks of *C. Trifolii*, on the other hand, even if at first insignificant, may become very severe and finally lead to the destruction of a lea. Slight attacks of *C. arvensis* never cause appreciable damage, especially when due to the intermittent germination of hard seeds.

In the first year of the cultivation of ground much infected with *C. arvensis*, the writer succeeded in obtaining perfectly immune plots by heating the seeds before sowing. *C. Trifolii* does much less harm to crops of bird's-foot trefoil than to those of clover and lucerne. In fields of bird's-foot trefoil *C. arvensis* germinates normally, but disappears gradually of its own accord without doing any harm. From the few observations which it has so far been possible to make the writer concludes that *C. arvensis* is much less resistant to cold than *C. Trifolii*.

(1) According to the *Index Kewensis*, *Cuscuta Trifolii* is a synonym of *C. Epithymum*. (Ed.).

759 - **Correlation between the Degree of Ripeness of the Seeds of Leguminous Weeds and the Rapidity of their Germination.** (1) — MUNERATI, O. and ZAPPAROLI, T. V. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 137-145. Modena, 1913.

During the summer of 1911, the writers undertook observations on the germination of seeds of leguminous weeds which reach the soil at various stages of ripeness, after falling or being detached by force from the plants; the species chosen were *Vicia segetalis*, *V. hirta*, *V. Cracca* and *Lathyrus Aphaca*, all typical arable weeds in the Lower Po valley. From the first experiments, the following conclusions are drawn:

a) In leguminous seeds which have not attained complete maturity on the parent plant, the integument is very permeable to water, so that they readily germinate as soon as they find favourable conditions of humidity in the soil; perfectly mature seeds, on the other hand, remain for a long time without germinating, because they have not the power of absorbing water.

b) Ploughing or mowing the stubble, which should be effected as soon as possible after the wheat is harvested, are of special importance in the control of leguminous weeds; by cutting down plants with ripening pods, many seeds are prevented from completing the seed-coat, which would have served to keep them for a long time in a dormant state in the soil.

c) Ploughing need not necessarily be shallow, for the unripe seeds readily take up water and thus germinate equally quickly whether they lie on the surface or are buried to some depth.

d) Weed seeds attacked by *Bruchus* are in most cases deprived of all vitality, but the few which are capable of germination develop immediately on meeting with suitable conditions.

Further researches were also devoted to determining the behaviour of leguminous seeds of different degrees of maturity; the following observations were made with lucerne seed: a) the riper the seed at harvest time, the larger is the number of seeds possessing an integument impermeable to water and *vice versa*; b) within certain limits, seeds germinate more rapidly, the longer the time which has elapsed between the harvest and the moment when they find themselves under favourable germinating conditions.

760 - **The Effect of Alternate Periods of Humidity and Drought upon the Germination of the Seeds of Wild Plants.** — MUNERATI, O. and ZAPPAROLI, T. V. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 3, pp. 157-195. Modena, 1913.

The slow or rapid changes in the moisture of the medium in which seeds happen to be, have very different effects upon those belonging to different species of weeds.

Some seeds are induced to germinate quickly when they are placed for a short time in a damp medium, after having remained for long consecutive

periods in a dry medium (alternation of three months in a dry medium with one week in a damp one).

In a constantly damp medium, only some of the same seeds germinate and these very slowly; while those which do not germinate often rot. The following behave in this manner: *Avena fatua* (large and small seeds), *Galium Aparine*, *Papaver Rhoeas*, *Plantago lanceolata*, *Amaranthus retroflexus*.

There are other seeds (*Rapistrum rugosum*, *Myagrum perfoliatum*, *Sinapis arvensis*, *Salvia pratensis*, *Abutilon Avicennae*, *Setaria italica*, *Oenothera biennis*) which, like the former ones, germinate in much larger proportions when the humidity is not continuous, but the total percentage of germination is always less.

Some seeds (*Calystegia sepium*, *Lappa major*, *Sorghum halepense*, *Solanum nigrum*), whatever the variations in the dampness of their medium may be, only germinate in very small numbers, even if numbers of them remain alive for a long time. Others again (*Vicia segetalis*, *V. Cracca*, *V. hirta*, *Lathyrus Aphaca*, *Cnicus arvensis*, *Eruca sativa*, *Daucus Carota*, *Cuscuta Epithymum*) always germinate successively and in about the same numbers, independently of the variations in the dampness of the medium. Seeds which are impermeable to water, and typically those of the Leguminosae, have (according to the results of the writers' researches) proved themselves to be less susceptible to variations in humidity; but other species of seeds have likewise behaved in the same manner.

There is yet another class of seeds which germinate in a greater or less proportion when dry and damp periods alternate, while they do not germinate in a medium which is constantly moist, although they are evidently mostly living. The seeds of *Panicum Crus-galli* and of *Rumex crispus* behaved in this manner in the experiments (80 to 90 per cent. of the seeds obviously living after remaining two years in wet sand); while the seeds of nearly all the other species placed in the same conditions either germinated or rotted. This probably explains why the above-mentioned plants are among the most abundant weeds in irrigated land.

## INSECT PESTS.

### MEANS OF PREVENTION AND CONTROL

- 761 - **Parasitic Fungi in the Control of the Larvae of *Chelonia caja*.** — PASTRE, JULES. Les chenilles bourruées. — *Le Progrès agricole et viticole*, Year 30, No. 16, pp. 491-492. Montpellier, April 20, 1913.  
PICARD, F. L'*Empusa aulacae* et la mortalité des chenilles bourruées. — *Ibidem*, No. 17, pp. 521-522. April 27, 1913.

A serious invasion of woolly bears (*Chelonia* [*Arctia*] *caja*) is at the present time ravaging a portion of the vineyards of Hérault.

On many of the already dried up or visibly diseased and dying larvae M. Pastre found a fungus, probably *Sporotrichum globuliferum*. Nevertheless, he believes that the first caterpillars only were attacked by the parasite, and that the new generations have resisted the pest until the present time.

M. Picard considers that the mortality among the woolly bears this

year is due to two very distinct diseases, the first being attributable to *Empusa aulicae* rather than to *Sporotrichum globuliferum*, while the second is caused by a totally different organism, which he is investigating, and concerning which he will shortly publish further particulars.

762 - On the Comparative Effects of Arsenic and Lead in Compounds used in the Control of *Conchylis*. — MOREAU, I. and VINET, E. in *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, First Half-year, Vol. 156, No. 11 (March 17, 1913), pp. 906-908. Paris, 1913.

It has been repeatedly recorded that in vineyard plots which had been successfully sprayed with arsenate of lead, the *Conchylis* larvae which escaped destruction were small, weakly, yellow and capable of effecting very little injury. In neighbouring plots treated with other insecticides (nicotine, for instance) the surviving larvae were, at the same date, normal, well-developed and as strong as the control specimens.

The writers wished to test the value of this statement by weighing the larvae and ascertaining whether the special effect attributed to arsenate of lead was due principally to the arsenic, or to the lead. The weights obtained proved that the effect noticed was essentially due to the arsenic. A similar result was obtained with copper arsenate, but iron arsenate appeared to be a very weak insecticide.

These observations show that, in order to estimate at its proper value the efficacy of arsenical applications in general, it is not only necessary to count the dead larvae, but also to observe those which have survived the action of the poison and which, at the usual time of the propagation of the *Conchylis*, are late in their evolution. It is not certain that this evolution will be complete, and even if it were, it is probable that the moths resulting from these larvae would be less fertile. In any case, the second generation, being very late, would do less injury.

It does not appear from the preceding researches that other arsenic compounds can be substituted for arsenate of lead; for, according to the observations of the writers, the treatment is most efficacious and the mortality largest with arsenate of lead as compared with other arsenical sprays.

763 - Control of *Epicometis hirta* in Hungary. — FÁBIÁN, MIKLÓS in *Koztélék*, Year 23, No. 32, pp. 1159-1160. Budapest, April 26, 1913.

*Epicometis hirta*, which attacks by preference the flowers of fruit trees, has this year invaded the fruit garden of the Normal School of Agriculture at Komárom. The garden consists of two parts: the nursery, which is tilled, and the orchard which is in grass.

All the fruit trees were in blossom when the appearance of *Epicometis hirta* was recorded, and in spite of energetic measures, the ravages of the pest could not be checked. Further, the practice of shaking the branches and collecting the fallen insects had its inconveniences, for on the one hand, the shaking caused many of the blossoms to fall, while on the other, many of the insects found shelter in the interior of the flowers, or even flew off before it was possible to collect them. During the operation, the writer noticed the curious fact that the insects only appeared towards 10 a. m.;

when the temperature rose, and were first found on the trees of the orchard, not appearing until later on those in the nursery. After a careful search, many of the pests were discovered upon flowers growing in the orchard, especially on dandelion (*Taraxacum officinale*), some of these harbouring as many as 4 or 5 insects at a time. Most of these individuals had their backs covered with mud, which leads to the conclusion that *Epicometis hirta* passes the night in the ground and then first proceeds to the flowers nearest the soil, choosing dandelions by preference. This explains why the orchard was attacked before the nursery. As a result of this observation, the writer began to hunt these insects at 8 a. m., collecting them especially where dandelions were in flower. The first day 3 quarts of *Epicometis* were thus obtained, and after a few days the first trees were entirely freed from these pests.

INSECTS  
INJURIOUS  
TO VARIOUS  
CROPS

- 764 - *Promecotheca cumingii*, a New Pest of Coconuts in the Philippines. — JONES, C. R. A New Coconut Pest. — *The Philippine Agricultural Review*, Vol. VI, No. 2, pp. 105-106. Manila, February 1913.

The writer records *Promecotheca cumingii* Baly, a beetle belonging to the family *Chrysomelidae*, subfamily *Hispidae*, as being a new insect, which is very destructive to the leaves of the coconut palms in the Philippines; the damage is done chiefly by the larvae, though the adult insects do some injury.

The eggs, larvae and pupae suffer much from hymenopterous parasites, the infestation being over 50 per cent. Should the beetle, nevertheless, increase in such numbers as to cause a serious outbreak, its control could probably be easily effected by collecting and destroying the infested leaves.

- 765 - *Scale Insects Injurious to Orange and Lemon in Spain*. — DE SALAS Y AMAT, LEOPOLDO. *Las plagas del naranjo y limonero en España*, 196 pp., 8 figs. Madrid, 1912.

The writer first describes the chief scale insects of orange and lemon in Spain. The following is a list of them:

*Chrysomphalus dictyospermi* var. *pinnulifera*: called "poll-roig" in Valencia, Tarragona and the Balearic Isles, "piojo rojo" and "cochinilla roja" in Murcia and Andalusia.

*Aspidiotus hederae*: "poll-blanc" at Valencia, "cochinilla blanca" and "piojo blanco" in Andalusia.

*Parlatoria zizyphi*: "poll-negre" at Valencia.

*Mytilaspis citricola*: "serpeta" at Valencia and in Andalusia, "purple scale" or "escama purpurea" in California.

*M. gloverii*: "serpeta larga".

*Dactylopius citri*: "cotonet" at Valencia, "algodon", "cochinilla algodonosa" or "de la tizne" in Andalusia, and "chinche harinosa" in the United States.

*Saissetia oleae*: "black scale" or "escama negra" in California, "cochinilla del olivo", "cochinilla de la tizne", "melaza" or "tizón".

Sr. De Salas then passes to the question of the destruction of these pests by means of their natural enemies, and enumerates various well-known insects which control the above-mentioned scales.

He also speaks of artificial control methods and considers that liquid insecticides are generally more trouble than they are worth; the one exception is lime-sulphur wash, of which details are given.

Fumigating with hydrocyanic acid, a practice of relatively recent introduction into Spain, is the best means hitherto adopted in the control of the scale insects of citrus trees; the writer describes the details of this treatment, which was known and applied in America as long ago as 1886, if not before.

The results of the experiments and observations made hitherto regarding this remedy are as follows: a) the use of hydrocyanic acid solves the problem of the control of the citrus scales of Spain; b) fumigating is the most economical method for obtaining the desired results and is attended with no danger; c) thanks to this system, *Chrysomphalus dictyospermi* var. *pin-nulifera* can now be considered as extirpated in Spain; d) hydrocyanic acid is an equally effective remedy against other scale insects; e) it is necessary to continue the study of *Dactylopius citri* in order to determine the best date for the application of the remedy and the minimum cost of its application; f) in order to meet the necessary expenses of the fumigation method, it is absolutely necessary to develop the spirit of co-operation amongst the different local agricultural classes; g) it is necessary to reform the "Ley de Plagas del campo" so as to make hydrocyanic fumigations obligatory in all citrus districts as a remedy for pests which have been proved to be eradicable by this means.

In conclusion, the writer mentions the sum of £6 000 given by the State for the development of the method of controlling *Chrysomphalus*, and gives some special instructions as to the practical application of the treatment described.



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NOTE. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of May and June 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

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FIRST PART.  
ORIGINAL ARTICLES

**The Progress of Cereal Seed Selection in France**

by

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Until the last few years the experiments on the production of the best cereals and their multiplication had been undertaken in France only by seedsmen, who, however, were well qualified for the task. For the last century they have studied foreign products, especially the English, comparing them with the local varieties, and then, having made their choice, they gave those varieties which seemed to have a sure future before them to experienced farmers for reproduction on a large scale, after which they distributed them at first in the richest provinces and then throughout the whole of France.

The firm Vilmorin has always occupied the foremost position in this introduction of foreign seeds. The chief stages of this work are known by the detailed description of the varieties exhibited about the middle of the nineteenth century at the English, Belgian and French agricultural shows, and then by the publication, several times rearranged, of a *Catalogue méthodique et synonymique des Froments* (1850 and 1895) and of well illustrated volumes bearing the titles of *Les meilleurs blés* (1880) and *Supplément aux meilleurs blés* (1909). The firm Denaiffe at Carignan (Ardennes) has contributed to introduce the best varieties of oats; the work of Messrs. Denaiffe and Sirodot, *L'Avoine* (1901), completed in 1908, is a monograph presenting the greatest interest to farmers, merchants and biologists. Lastly, in several large agricultural centres the Experiment Stations publish regularly the results of their comparative tests of the novelties recently produced in the country or imported from abroad. Thus M. Florimond Desprez has summarized the results of his experiments in a series of pamphlets and articles under the title *Culture des différentes variétés de Blés à la Station expérimentale de Cappelle* (Nord) (1888 and following years)

These publications have been very useful to the farmers of the North of France, of Flanders and of Belgian Hainaut.

On the other hand experimenters of great capacity and men of science among whom may be mentioned Louis and Henry Lévêque de Vilmorin, Schribaux, Gatellier, Philippe de Vilmorin, have contributed to keep awake in our country the desire of knowing the varieties most adapted to our soils. They would have continued and developed the works of Lecouteur in Jersey, of Desveaux at Angers, of Seringe and of Jordan at Lyons if the evolution of the seed trade and industry had not to a certain extent limited their intentions. The sale of grain on samples, the disappearance of markets, and the substitution of great mills for small local ones have brought in their train uniformity of prices and have caused the disappearance of that care with which the seeds of various qualities were studied and classified about the middle of the nineteenth century. The farmers of the last two generations only care to obtain as cheaply as possible the seed capable of giving the highest yield of crop to be sold by weight. The use of heavy doses of chemicals has created a demand for rapidly growing varieties with stiff straw and compact ears, capable of standing liberal nitrogenous manuring without lodging. Thus excellent local varieties were set aside on account of a single defect and the choice of new varieties was determined more by the absence of some defects than by the possession of real qualities. It may be said for the great bulk of our cereals that this is the system still prevailing.

Nevertheless it ought not to be forgotten that (excepting the resistance to intensive manuring) the aptitudes of varieties to give heavy crops have a notable influence on final results. In the United States, selection by pedigree with valuation of the lines according to their descentance (centgener power) has enabled Mr. W. N. Hays to replace *Fife* and *Blue stem* wheats by *Minnesota* No. 163 and *Minnesota* No. 169 derived from them. The average yield per acre was increased by 1 ½ bushels, which signifies a yearly increase of crop estimated at a million dollars for Minnesota alone. Similarly in Sweden, according to the calculations of M. Nilsson-Ehle, the recent substitution of the pedigree wheat *Extra Squarehead II* for its parent *Extra Squarehead I*, which was already highly appreciated, gives an increase of yield of 15 per cent. It is thus highly advantageous, from the only point of view at present taken by farming on a large scale, to adopt pedigree seed; but this subject has already been very well treated in the previous Bulletin by Messrs. N. Hjalmar Nilsson (1) and Nilsson-Ehle (2) and I shall not insist further upon it.

The work done at Svalöf was not known in France before the commencement of this century. A pamphlet by M. Basil Macalik on *Hanna barley* (1900) made the managing committee of the syndicate of French brewers

(1) N. H. NILSSON: The Swedish Institute for the Improvement of Field Crops at Svalöf. — B. June 1913, pp. 834-843.

(2) H. NILSSON-EHLE: Improvement of Wheat and Oats at Svalöf. *Ibid.*, pp. 844-852.

acquainted with the methods followed at Svalöf; they considered it advisable to visit the Svalöf Seed Experiment Station and to introduce the Swedish pedigree varieties in some centres where good French barleys were raised (1902). The malting of the pedigree barleys having given good industrial results a *Society for Promoting the cultivation of Malting Barley in France* (1903) undertook to carry out the following program: "1. Introduction into France of the Swedish pedigree varieties and surveillance over those lots which preserved their purity. 2. Separation from the best native varieties of pedigrees which might later replace the Swedish pedigrees".

The guaranteed capital of the new Society, upwards of £ 2 000, was not utilized. The members defrayed the annual expenses of purchase, distribution and control of Swedish seed and the cost of research of native pedigrees by shares, the total of which was kept between £200 and £240. This slow method applied patiently during ten years had the result of preparing the majority of maltsters for this kind of work and of not alarming farmers, who mistrust any more or less interested initiative.

The success that attended the movement gained the support of the scientific institutions and of the Government. In 1908 the *Académie des Sciences de Paris* granted the botanist of the Society a subvention from the Bonaparte fund, in consideration of "the great theoretical interest of his researches and of the important practical applications they will have". From 1909 to 1911 the *University of Paris* facilitated the extension of the work by a subvention from the Commerce Legacy; in 1912 the Minister of Agriculture granted the Society itself a subsidy. The *Institut Pasteur* of Paris hospitably offered the use of its laboratories and granaries for the study of plants during the winter, and an agricultural biological service was soon created (1909) with a much larger programme, embracing research on all the cereals, on tobacco, fruit-trees and some other industrial plants. The processes of selection by pedigrees devised at Svalöf have since that date been applied to the selection of domestic animals as regards their productivity and resistance to disease.

The principal practical results obtained by this work on cereals, continued for ten years, are the following:

Among the Svalöf pedigree varieties which have given excellent results in France *Princess* barley deserves to be mentioned as foremost of all. Its somewhat slow ripening is amply compensated in some districts by a remarkably high quality of grain and heavy yields. *Hannichen* barley is too early and soon degenerates in Champagne where Nolč's *Bohemia* keeps true longer. *Chevalier II* barley of Svalöf does very well in Mayenne, where it has been grown for ten years; on the contrary, it has not been possible to keep *Primus* and *Svanhals* true, even in the North of France.

For this region the Society has prepared and studied with care the pedigree varieties selected from the local varieties. *Bourbourg* and *Cistercienne*, of which it possesses several well tested lines, suit the fertile soils of Flanders, Belgian Hainaut and the country round Paris; but the profits that can be realized without great efforts from the cultivation of wheat will always keep the growing of pedigree barleys in a second-

dary position notwithstanding the fact that the many maltsters of the country are disposed to pay handsomely for them. On the other hand the raising of native pedigree kinds has much developed in Haute Loire and Indre, in Maine, where a new pedigree barley *Comtesse* (0.117) thrives well, in the neighbourhood of Saumur and in Aube, where the pedigree barley *Sarah* (0.156) has stepped into the front rank formerly held by *Bohemia*. In the centre, in Allier and Puy de Dôme, *Chevalier français III* (0.302), of the same origin as *Chevalier II* from Svalöf, succeeds better than the latter and yields heavier crops because it is later.

The problem of the improvement of wheat, especially from the theoretical point of view, is still in its preliminary stage; the selection of oats and rye do not seem to hold out any immediate prospect of utility in France. For fairly rich soils we have some good varieties of oats which are much esteemed on the markets, and the use of Svalöf pedigrees is recommended for rich soils. The acquisition of several early and medium-early large-grained maizes has not been followed by any demand for them on the part of the farmers and we are always more and more dependent on America for this cereal.

It must be recognized that the movement in favour of the pedigree varieties of cereals is still very limited, and that it has arisen without the active cooperation of farmers, who watch its progress with scepticism, if not with indifference; this depends without doubt on the subdivision of the land and of estates, on the still rudimentary education of farmers, and on the independence and easy life of the peasant proprietors, who sell their wheat at a high price. There is no demand in France for better seed on the part of farmers; what they find in abundance on the market seems good enough for them.

Swedish landowners are more highly educated and for the most part farm larger holdings; they are subject to a severer climate and have associated spontaneously with the object of soliciting the aid of competent botanists who have specialized in the study of one or more farm crops. Grouped into a Society to which they contribute their financial and moral support, they were not long in profiting largely by the discoveries, which every day become more important, made by their scientific fellow-workers. The Svalöf institutions, which thirty years ago constituted only a small private society, have drawn into their movement thousands of farmers of all the provinces of Sweden and represent a great national asset.

In France, the progress achieved is in reality only the result of the competition which causes evolution of the food industry.

Thus it is the directors of breweries, and the chemists familiar with the utilization of malt, who really select malting barleys in France. They alone can appreciate the value of pedigree lines among which the botanist would hesitate before making a final choice. The brewers then demand from the maltsters the necessary precautions to prevent the choice barleys being mixed with others; these consent to make on their own estates the experiments of multiplication of those pedigree lines that the Society hands over to them in small quantities; they then increase their prices for all the important lots, the purity and origin of which are guaranteed; it is only

by this surplus value of the crops that the farmers have been hitherto induced to respond to the invitations of the brewing industry. This transitory and still quite localised effort has had a very curious result: the high prices offered for the pedigree varieties available on the market have caused a rise in the prices of ordinary barleys, even the most common, of those districts; and this success, which was not foreseen, has allowed local farmers to realize considerable profits to the detriment, fortunately only temporary, of those who have spread the new methods and seeds.

In analysing the causes of the indifference of French farmers to the progress of the improvement of seeds, the following may be mentioned as the most important: the subdivision of the holdings, the affluence, or at least the easy circumstances, of the French peasant and farmer and especially their fear of the unknown, of experiments, and of that unsettledness which is so dangerous to small farms. The foresight and the doubts of our farmers, which are often called ignorance and spirit of routine, forcedly limit the efforts of the most enterprising merchants and of the most confiding industrial firms. Nevertheless, if the system at present adopted by the brewers endures long enough to offer some security to the farmers, there is no doubt that there will be a rapid and decided progress.

The industrial firms that purchase are decided to maintain their demands; the education that they have had gives them full confidence in the pure products that can only be guaranteed by the use of pedigree varieties. Having obtained unexpected results from the use of pure ferments, from the preliminary sterilization of worts discovered by Pasteur, they become enthusiastic partisans of the Svalöf methods based upon the same principles. The following are some other examples of the applications of the same method.

The problem of the economic production of wheat possessing high baking value, which causes such extensive work in Canada, in the United States, in England and in British India, is hardly known in France, and yet our millers pay American wheats, with which our markets are not always provided, five times their value; a small quantity of those wheats, suitably mixed vastly improves our spring wheat flours, which are almost all starch, and which are at present the most widely spread kind. It is under the indirect form of freeing our millers from American imports that the problem of improving French wheat will be presented. In 1909 the Director of Agriculture at the Ministry of Agriculture, M. Vassilière, requested me to examine the question under this aspect by preparing an enquiry on the varieties of wheat at present grown in France.

The selection commenced in 1908 by the Sugar Company of Bourdon corresponds very closely to the same object. The fertile plains of Limagne which supply the Puy de Dôme sugar factories with sugar-beets are also an important centre for the production of semolina wheats which are bought at a premium by the Marseilles mills. The ever increasing extension of this industry has kept the prices of the raw material sufficiently high to render for the last thirty years the semi-hard long-strawed wheats, which are sown in the autumn after beets, one of the steadiest sources of profit of

the district. The not very high prices of sugar during the last few years have not seriously affected the Bourdon sugar factories, who have convinced their clients that beets are an accessory crop which prepares the soil to produce good and highly remunerative wheat.

The problem of the improvement of Limagne wheats was put before me in 1908 in the following form. Is it possible to obtain from the Taganrog variety grown in the district for the Marseilles mills, lines maturing earlier than the varieties hitherto known, but equally productive and less liable to rust? I proposed to adopt the method of "pedigree culture" so judiciously used at Svalöf, and, without great expense, at the end of four years we obtained results which represent a considerable progress on the point of departure; of the six lines chosen as being decidedly superior to hundreds of others mixed with them only one or two are to be grown on a large scale. But it must especially be remembered that the botanical selection of the Limagnes wheat has been undertaken by chemists and directors of sugar mills, men who have long been familiar with the technique of selection and with the statistical control of hereditary qualities; with the assistance of these competent men, progress has been rapid.

Our farmers, with their imperfect education, can hardly be reproached for showing a certain distrust of this form of sales and for entertaining the suspicion that the offered premiums conceal some snare. They have only recently protected themselves by special laws against frauds in the fertilizer trade and they are always threatened by the invasion of their markets by substitutes for milk, butter and even meat. But they will not resist the strong temptation to buy the best seeds and to raise from them the best crops of the district. Thus full confidence can be placed in the future of pedigree and guaranteed varieties. The security which results from their use and the higher value of their crops are two elements of success that cannot be weakened by some commercial agreement respecting the control of the produce that is delivered.

It is besides indispensable that the societies that distribute the seeds should analyse them regularly at every generation. They must prepare themselves to replace from time to time by new varieties those which no longer afford full satisfaction. This is done by the Svalöf Society for the Purchase and Sale of Seeds, and in France by the Society for Promoting the Cultivation of Malting Barleys.

After three successive attempts to introduce Svalöf *Princess* barley into Champagne, the managing committee was convinced that the crops would be only moderate in wet years and decidedly bad in dry ones. Farmers, grain-brokers, maltsters and brewers were all agreed upon this point, because the results obtained from pure seeds are always very marked. The Society thus did not have any difficulty in withdrawing from circulation and cultivation the products of *Princess* barley in Champagne, but the same barley succeeded so well in Indre that certain farmers managed to sell their crops as seed under another name and without submitting to a control which is very severe. Maltsters who buy in that district recognize *Princess* at first sight, and the workmen who receive the bags or attend to

the steeping have no difficulty in separating it from other barleys. It is very interesting from a general as well as from a practical point of view to learn that *Princess* barley has not yet shown, after ten years of acclimatisation in a suitable district, any change in morphological and physiological characters, any degeneration or decrease in yield or in extract for the brewery.

Such is not always the case and this is the very reason of the compulsory yearly control to which the seeds of the Society must be submitted. Thus *Chevalier II* of Svalöf, which gave an average of good results, after eight years no longer deserved its name without a renewal of the seed. I have even been able to discover a very unexpected fact, which is of the greatest interest in the question of the fixity of hybrids. *Svanhals* barley, fixed and controlled at Svalöf, grown in Somme gave in two successive years segregations revealing its hybrid origin. This pedigree variety is recessive as to the character of the presence of spines on the flowering glumes; in Sweden it is stable and with smooth glumes, while if grown on the dry and calcareous hill slopes of Picardy it gives a high percentage of grains with spines. The ears of this variety offer even a mosaic of smooth and spiny grains, which has led me to the discovery of "mosaic heredity" (1908 to 1912).

As soon as the Society for Promoting the Cultivation of Malting Barley in France became acquainted with this result in 1906 it had *Svanhals* barley withdrawn from the trade and from further tests, although it is a highly recommendable variety and much esteemed in the North of Europe. Similarly at Svalöf, but for other reasons, *Hvitling White Probssteier* and some other oats, which had a great success towards the end of last century, are no longer produced. According to M. Nilsson-Ehle *Grenadier* wheat is also doomed to disappear shortly. It will be said that this mode of proceeding has long been known, that it has been adopted by all firms dealing in cereal seeds. Certainly, but the facts that *Hvitling* oats are so easily and surely recognized and that Svalöf alone is qualified to sell them with guarantee, render it possible to withdraw this cereal from the market and to replace it rapidly by another more suitable pedigree variety.

The following is another very important advantage obtained: it is well known that agricultural centres are periodically threatened by epidemics, mostly fungoid diseases, which cause enormous losses. The present general conviction is that the majority of these diseases are to a great extent spread by the use of infected seed. The introduction of pedigree seed must largely limit the danger of the spread of disease by the simple fact that very severe observations extending over a long time are necessary for their preparation. I have been able, in preparing native varieties for Champagne, to eliminate some very interesting pedigrees which were much less resistant to smut (*Ustilago*) than other pedigrees of the same origin. The very dry year 1911 rendered a great service in revealing which pedigrees were weakest from this point of view.

But the resistance to fungoid diseases, to cold, and to lodging is a function of the climate and soil; it is therefore to be feared that some kinds of pedigrees, transferred to a distance from the locality in which they have been

studied, may become diseased or allow the germs of disease which they carry to become apparent. The increasing control at every generation of pedigree varieties reveals the danger and permits its avoidance. It is not more difficult for the societies that buy and sell pedigree seeds to withdraw from circulation the product of a few acres of rusty wheat than it is to suppress in Picardy *Svanhals* barley, which there does not preserve the morphological characters which allow of the yearly control as to its purity.

The method of the preparation and diffusion of the varieties of pedigree cereals devised at Svalöf, and practised in Sweden and in France, allows the most important problems of modern agriculture to be solved. The increase of yield, the greater value of the product guaranteed to the industries that use it, the security of purchases and sales, the protection against diseases, are the principal, though not the only, advantages that French agriculture will reap from the use of pedigree seed, controlled at each generation.

#### BIBLIOGRAPHY.

- I. BLARINGHEM. *Etudes sur l'amélioration des Crus d'Orges de Brasserie*. Paris, 1910 228 pp. in 8°.
- I. BLARINGHEM. L'amélioration des Orges de Brasserie en France. — *Annales de Gembloux*, June 1, 1912.
- I. BLARINGHEM. Méthodes pratiques de Sélection et lignées pures. — *Rapport au Xème Congrès international d'Agriculture*. Held at Ghent in June 1913. 10 pp. in 8°.
- I. BLARINGHEM. L'hérédité des maladies des plantes et le Mendélisme. *Rapport au Ier Congrès international de Pathologie comparée*. Held in Paris, October 17 to 23, 1913. 62 pp. in 8°.
- I. BLARINGHEM. Sur l'hérédité en Mosaïque. *Rapport à la IVème Conférence internationale de Génétique*. Held in Paris, September 1911. 31 pp. in 4°.
- A. KREISS, P. PETIT and I. BLARINGHEM. *Rapports annuels présentés à l'Assemblée générale de la Société d'Encouragements de la culture des Orges de Brasserie en France (1904-1913)*. 10 brochures in 4° with plates. Paris, 22 bis Avenue de Wagram, seat of the Society.

### The State of Agricultural Plant Breeding in Austria

by

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The improvement of plants most commonly grown in farms commenced in the seventies. As in Germany, a few farmers started the movement and their work awoke interest in the subject.

A theory of the improvement of plants developed later. It began in Austria with von Proskowetz. In 1892 the first lecture in Austria on the improvement of agricultural plants was delivered by Fruwirth at the Higher School of Agriculture in Vienna and in 1900 the first publication of the theoretical bases and technique of general plant improvement was made in "*Die Züchtung der Landwirtschaftlichen Kulturpflanzen*" (Fruwirth).

Special plant improvement was developed later. At present Austria possesses two independent chairs for the teaching of plant improvement, one in Vienna at the Higher School of Agriculture (v. Tschermak), the other at Felschen-Liebwerd (Freudl).

Side by side with independent work in plant improvement carried out by individual farmers, work was also commenced in Germany by public institutions in conjunction with private individuals, mostly peasant farmers. Such cooperation was started in Bavaria by Kraus and in Austria in 1902 by v. Weinzierl at the Seed Control Station in Vienna.

The further development by Austrian investigators of the theory of the improvement of plants need not be discussed here; it is, however, worthy of note that an Austrian, v. Tschermak, took part in the rediscovery of the results of the researches of the monk of Brunn, Gregor Mendel, which have acquired such great importance in connection with the laws of heredity. In the review of the present state of plant improvement, which is the object of this paper, improvement by private persons will first be dealt with and then that by, or together with, public institutions.

The last publication on the improvement of plants in Austria was made in 1896 (1). As there was not then any so-called national plant breeding (*Landespflanzenzucht*) it limited itself to a description of the breeding farms of independent farmers. The names of one breeder of rye, one of barley, one of oats, five of potatoes and seven of sugar-beets are given. To these should be added v. Zelenski of Gradkowice and F. Noll of Ober-Pöterni in Bohemia not mentioned there; v. Zelenski began in Galicia in 1822 to improve Galician bearded wheat and Polish rye, which spread widely in Galicia. Noll began his work of improvement with barley and potatoes in 1887, but the results of his activity which were already then much esteemed, were not known in wider circles till later.

Of the 17 above-mentioned breeders, only six still continue to work. They are: v. Proskowetz at Kwaffitz, improvement of barley, sugar-beets and lately rye; Wohar & Co., Prague, sugar-beets and, recently, mangolds; Dolkowski at Nowawies near Kenty, potatoes; Zapotil at Vetrusic, sugar-beets; Noll at Ober-Pöterni, barley and potatoes; v. Zelenski of Gradkowice, wheat and rye; and Hennings now at Herrenleis near Ladendorf, potatoes. The selection of sugar-beets has attained special importance for the supply of the home market, which however still takes up large quantities of seed raised in Germany.

The improvement of barley was the first to spread the reputation of Austrian plant breeding. The Hanna barley of v. Proskowetz, even when still simpler methods of selection were used than those at present employed, was much appreciated throughout Central Europe.

Another production that very soon obtained recognition abroad was that of the improved potatoes of Dolkowski of Nowawies. Besides Hanna

(1) *Landwirtschaftliche Pflanzenzüchtung und ihre Stätten in Oesterreich*. Leipzig and Vienna, Deulick, 1896. (Author's note).

barley, Noll's improved barley was also much esteemed and like the former found its way to Hungary, Germany and France.

Since 1896 several breeding stations have been added to those mentioned above. Two of the new ones, devoted to the production and exportation of large quantities of seed, are specially important: the Central Establishment of the Noll and v. Dreger Breeding Association at Chlumetz, and the Seed-Producing Farm at Loosdorf in Lower Austria. The former disposes of the original seeds of v. Lochow's and Strube's growth and of its own raising: Early Imperial, Bohemia and Earliest of All, Dreger's Bohemian Red Wheat and Dreger's Bearded Spring Wheat. The breeding of barley is carried out by Noll at Ober Počerniř, that of wheat by v. Dreger at Chlumetz. The seed farm at Loosdorf, which began breeding in 1903, is under the management of Director Schreyvogel and produces at present, besides wheats (Loosdorfer Red Bearded Winter Sb and Spring Sa), Lea, Maroh and Thaya barleys, as well as oats and rye. It has also commenced with mangolds.

Besides these breeding establishments, several others work independently in Bohemia and Galicia. In Bohemia the Imperial and Royal domain of Jenc breeds wheat, Prince Schwarzenberg's estate Protivin since 1904 produces especially Bohemian wheat and also Bohemian rye and Probstei barley, Jiva at Vratno raises mangolds, and the seed-breeding company Pardubitz since 1906 produces sugar-beets. Dr. Holy, at Stepanovic, has included in the field of his activity the production of grasses which until then had been completely neglected in Central Europe. In Galicia, Count Scipio, at Lopuszka, has been engaged since 1900 in the first place with Galician wheat, of which two forms are bred, one bearded and the other beardless; then with Sandomierska, a local variety from Russian Poland. Two of his crosses endeavour to unite the good qualities of Galician wheat with those of Square-head. In the same year breeding was begun at Mikulic. The landowner v. Dobczyc, at Turnau, has also bred several forms, from Galician wheat bearded and beardless, and two crosses of Galician wheat and Squarehead: Lozinka and Binlka, besides rye, oats and four-rowed winter barley. Buszczyński and Łazyrski, a Russian firm, has been breeding sugar beets since 1886 at Niemierze in Podolia and since 1905 also at Gorka Narodowa in Galicia. Three types, each for different conditions, are bred.

Breeding in connection with public institutions, so-called local plant breeding (Landespflanzenzucht), was begun first in Lower Austria. The director of the Seed Control Station in Vienna, v. Weinzierl, had already in 1887 attempted to obtain an improvement of the conditions of the production of seeds. The foundation of establishments for the cultivation of cereal seeds—corresponding to what are now called seed farms, was contemplated. The institution, however, had not fully satisfied its originator, and in 1902 a section for plant improvement (Inspector Pammer, Assistant Freudl) was added to the Seed Control Station. It commenced the breeding of plants of the locality on the technical lines of Neglisch of Dresden. In 1904 breeding was carried on in 10 centres, which by 1912, had become 12 mostly connected with large estates. Since 1910 all three sections of the

Seed Control Station have carried on breeding; to the raising of cereals the breeding of forage plants and of potatoes and maize have been added.

Cooperation with public institutions for the improvement of the plants of the country is practised in Upper Austria, Bohemia, Styria, Moravia and Galicia.

In upper Austria the former president of the Agricultural Society, Herr Wieninger, took the greatest interest in plant improvement and arranged his farm at Otterbach as a breeding farm. It was a kind of central station for Upper Austria; it produced several cereals, seed of which was mostly distributed to peasant farmers. The owner subsequently gave up the work. Four large farms have partly independently and partly in connection with Otterbach begun to breed: v. Boschan's farm at Achleitin was the first to engage in the work.

Carinthia possesses since 1911 a breeding garden at Maria Sual, founded by the Provincial Agricultural Council.

In Bohemia the cooperation of public institutions of the Province commenced in 1911. In connection with the German section of the Provincial Agricultural Council, the chair of plant breeding of the Tetschen Lieberwerd Academy (Prof. Freudl) undertook the advisorship of three breeding farms: Postelberg (Prince Schwartzenberg) for wheat that may be sown in spring or autumn, and Hanna barley (since 1907), and two farms subventioned by the Provincial Agricultural Council: Friedland (since 1906) for local rye, and Duppau for oats (since 1909). In two of these, namely Friedland and Duppau, which are connected with peasant proprietors, the work of selection also has been undertaken by the above chair. In 1912 a fourth breeding station similarly subventioned was added to the list: Saaz, for barley. The advisorship of another breeding farm in Bohemia: Oberstankau (Schreiner), for rye and oats of the country, has been undertaken since 1907 by the 1st section of the Vienna Seed Control Station (Pammer).

The Czech section of the Provincial Agricultural Council began in 1904 to turn its attention to plant breeding. Wheat, rye, oats and barley were each to have had a medium-sized farm provided with all the necessary outfit and with technical direction. Of such stations only the Loncovà farm is still engaged upon oats. After several changes the improvement of wheat was undertaken by Prof. Jellinek, of Prague, that of rye by Director Babanel, of the School of Agriculture at Rokytzan; Prof. Munzar, nominated by the Provincial Agricultural Council to the post of director of the improvement of the plants of the province, took over the institution for the improvement of forage plants which had been founded in 1909 at Tabor by the Provincial Agricultural Council.

Styria has since 1908 adopted the cooperation of public institutions somewhat differently. At the Agricultural School of Grottenhof there is a breeding garden under the direction of the Seed Control Station of Graz (Dr. Hotter) which gives its selected seed to the school farm for multiplication, whence it passes to recognized seed farms; these grow it and sell it by means of the agricultural association of the province. In 1911

two other breeding centres were instituted and placed under the same direction.

In Moravia the Czech section of the Provincial Agricultural Council has turned its attention to the breeding of Hanna barley. Already previously, at the suggestion of Prof. Macalik, an association had dealt with the breeding of this variety. The Provincial Agricultural Council has recognized, in a series of experiments which were commenced in 1901, that the Kwafitz Hanna barley is the best, and arranges for it to be grown by 23 breeding stations in the province. At the agricultural school in Prerau, at the request of the Provincial Agricultural Council, the breeding of grasses has been begun by inspector Nevral. The German Moravian Agricultural Association deals with the breeding of Moravian mountain oats. The agricultural experiment station at Brünn, which under director Varka dealt chiefly with the improvement of barley, now under director Spisar selects other plants also.

In Galicia plant breeding with the assistance of peasant farms has not been carried out. The agricultural association has entrusted the director at Dublany, Mieczynski, with the task of advising the breeders of the province.

The attempts to introduce national plant selection are recent, so that the effects of the supply of seed to the peasant farmers on the agriculture of the country can not yet be felt. The national plant selection, in so far as it is carried on with this cooperation of peasant owners, has mainly the task of working locally and for peasant owners. The preparation by peasant farmers of considerable quantities of uniform first-class original seed for the trade is rendered very difficult by the limited extent of their granaries and barns and conveniences for cleaning and selecting.

What can be attained by the so-called national plant breeding is the gradual supply to peasant neighbours of better seed than that used up to the present. In those cases in which public institutions work together with the owners of large estates, the latter differ from independent selection farms only in the fact that the former can avail themselves of the assistance of the technical experts of the public institutions.

The independent breeding farmers of Austria have hitherto sufficiently provided the home market with selected seed and have also gained a footing abroad. What would still be desirable is that the owners of large and medium farms that do not select their seeds should value selected seed more highly than they do at present. The improvement of seed can only attain far-reaching significance for the agriculture of the country when, besides the work of selection as such, the production of improved seed is correspondingly developed. At present great demands are made upon the seeds turned out by breeding establishments, which the breeder can only satisfy by the high condition of his fields, granaries and barns and through development of his mechanical arrangements for cleaning and grading seeds. In this respect also the large seed-breeding farms of the Austrian independent seed producers occupy a high position.

The majority of Austrian breeders have found since last year in the Austrian Association for Plant Selection a representative of their interests. This association, which considers the improvement of the technique of plant selection as one of its chief aims, has started a Breeder's Book, in which, after examination of the farm by a commission, the corresponding selections are entered. This provision is copied from the breeding register (Hochzuchtsregister) of the Deutsche Landwirtschafts Gesellschaft and is intended to protect the products of the plant breeder and to guarantee the purchaser that the work of improvement is properly carried out by the breeder.

## Agricultural Plant Breeding in Germany at the Present Day

by

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The breeding of agricultural plants in Germany has reached its present high state of development without State, or official, assistance. Its success is entirely due to the initiative of individual far-sighted agriculturists who have recognized the importance of improving cultivated plants by means of selection, and the satisfactory results of their labours prove how much can be effected in this direction by means of self-help. It is only recently that the Government, in some States where small holdings are the rule, has made arrangements by which the small farmer may enjoy the advantages of the work done in plant breeding.

Plant breeding in Germany began in the first ten years of the nineteenth century with the improvement of the mangold. In the middle of the forties the threatened ruin of the potato industry caused by the potato blight led to the improvement of the potato, while that of the sugar-beet, though it had begun early in the century, was not practised to any extent until the middle of the nineteenth century. Cereal selection started latest of all, and, with the exception of a few isolated attempts, dates only from the middle of the sixties. Steiger (at Leutewitz) and v. Borries (at Eckendorf) may be regarded as the founders of mangold breeding in Germany, while the honour of being the first potato breeders falls to Elsner v. Gronow and Paulsen (at Nassengrund). Klein Wanzleben is the birth place of German sugar-beet breeding, and Wilhelm Rimpau of Schlanstedt may be regarded as the father of cereal breeding in Germany. With the development of the cultivation of sugar-beet and the consequent adoption of intensive agricultural methods, plant selection became of greater importance, for the existing varieties were unable to profit by the improved conditions of cultivation; indeed in the case of cereals the yields were actually reduced owing to the lodging caused by better cultivation. Although more productive

varieties were imported from England, Denmark, France, etc., to meet the demand, they failed in many districts, showing clearly the importance of using properly acclimatized varieties, and very soon a few preliminary attempts were made to improve the new varieties by selection. These gradually extended and before long came to include most of the cultivated plants, though the improvement was unequal amongst the different species.

Mass-selection was adopted as the sole method of improving varieties and was applied to the reproductive organs: thus mangolds were selected by the shape of their seed glomerules; but later mass-selection was extended to the whole plant, and in the case of the mangold, to its dry matter and sugar content. This method of mass-selection, which is now no longer practised in plant-breeding, gave excellent results in the case of cereals, mangolds, and other plants, which have not been surpassed by more intensive and scientific methods and it is important to realize this fact in order to understand the first period of plant selection in Germany.

The new varieties produced at this time owe their existence, for the most part, to the isolation of certain types from amongst the old native varieties or to the propagation of new types showing deviations from the parent type (*i.e.* mutations), which deviations, being hereditary, facilitated the work of selection.

Modern selection of agricultural plants in Germany is based on the choice of individual whole plants, due regard being paid to all their important qualities. Such selected plants are grown and propagated separately, and their breeding value is judged by their offspring. The real selection, therefore, is based on the plant's reproductive capacity; it is the capacity of the plant to produce good offspring which is called into question, and its appearance and exterior only serve as indices in selection until such a moment as its worth is proved by the quality of its descendants. Working in this manner the best pure lines are obtained where the plants are self-fertilizing (Johannsen), while in the case of cross-fertilized varieties a superior strain or a good family may be obtained by crossing similar plants and subsequently selecting the best individuals. A rigid selection must continually be practised, and in doing this, it must be borne in mind that cross-fertilized plants exhibit a considerable variability and even though the chief characteristics of the pure lines taken as a whole remain unchanged, nevertheless, even here, differences occur and may lead to modifications, either favourable or the reverse, which therefore should either be used to improve the variety, or eradicated to preserve the purity of the strain. As such deviations cannot always be detected from the external appearance, the testing of the offspring of the selected individuals cannot be entirely neglected, even though it be not necessary to practise it regularly.

The continual selection of the best ("Deutsches Auslesenverfahren" Fruwirth) which the breeder formerly believed to be necessary in order to increase the productiveness of his variety, and which it was incumbent upon him to observe so long as he worked with mixed lines, is still useful.

The test of productiveness, as a rule, begins in the experimental breeding plot, where the descendants of the best plants are grown in equal and, if

possible, large numbers in adjoining rows and under similar conditions. The offspring which prove to be weak, little resistant, or in any other way undesirable, are weeded out, the rest being further tested in the field in order to obtain as soon as possible an exact knowledge as to their cropping powers and other important economic qualities. The practice of judging individual plants by points given for as large a number of characteristics as possible, is being superseded by the systematic testing of their descendants in the field. The former system served only to supply a basis for later comparisons and to avoid the necessity of detailed entries in the plant register. Much of the testing apparatus which was formerly considered indispensable, and in any case served to adorn the plant-breeders' laboratory, is now seldom used.

There are countless records of the success in *sugar-beet breeding* and the fame of this work has spread far beyond the borders of Germany itself; by its means a high yield and a high sugar content have been combined, and beets have been obtained which are remarkable for their hardiness and other useful qualities.

In *mangold breeding* the varieties combining a large yield and a high content of dry matter have been rather left behind by those which have been bred either for large yield alone (Eckendorf and numerous other varieties) or solely for a high dry matter content (Lanker, etc). The combination of both qualities in a high degree has not yet been attained, though both have been remarkably developed in separate varieties. Mangolds with a high content of dry matter are valued chiefly for their superior keeping quality, and are therefore grown to supply the demand in spring, while those varieties which produce the large yield and whose keeping qualities only enable them to be used during the winter form the main part of the crop.

*Cereal breeding* is very widely distributed, owing to the large acreage usually under these crops. Numerous new varieties of all cereals have been created, partly by selection from foreign varieties adapted to the local conditions, and partly by working on indigenous varieties. Great success has been met with by breeders of wheat, barley and oats, but these have been surpassed by the performances of F. v. Lochow with rye at Petkus. We have cereals of all kinds suitable for the very varying climatic and soil conditions of Germany. Some are hardy and resistant, bearing fair crops under unfavourable circumstances, others are very productive but more exacting, whilst others again are mediocre as regards their yield and moderate in their requirements. This specialization has greatly increased the cereal crops and made them more certain, and its importance is in no wise lessened by the fact that some individual varieties can be successfully cultivated under many different conditions.

A special position is occupied by *potato breeding*. The new varieties of the potato which are placed on the market exceed in number all the other productions of agricultural plant breeding. The success of many of these new varieties is, however, but short-lived, relatively few of them being of any real worth; there are, nevertheless, sufficient of the latter to

supply the demand. The German potato-breeder has certainly done great service to agriculture; by his exertions the old varieties, which had deteriorated in productiveness and general hardiness have been superseded by new kinds which in many cases have proved of the greatest agricultural importance. This success has, almost without exception, been the result of crossing, and it is only quite recently that new varieties have been created by selecting the modified forms arising amongst old varieties, as in the method adopted by Lochow at Petkus. Whether the satisfactory result of this practice is due to an unusual prevalence of bud-variation, or is to be attributed to other causes, cannot at present be determined.

Very satisfactory results have also been obtained in breeding Leguminosae; new and excellent varieties of peas and beans especially have been produced, occasionally by hybridization but more often by the use of mutants. Attention has also been paid now and again to the improvement and creation of new varieties of other members of the order, *e. g.* lupins.

The selective improvement of forage plants (clovers and grasses) is still in its infancy, but the attempts, which have been made in this direction through the isolation of types are so promising that there is no doubt this work will soon be crowned with success, in spite of the technical difficulties which impede it.

Little worth notice has been effected in the breeding of other agricultural plants; in not a few cases (French beans, carrots, cabbages, etc.) gardeners have so long occupied themselves with their improvement that there is little cause for the agriculturist to concern himself with the matter. It should, however, be mentioned that the breeding of vines has advanced from the theoretical to the practical stage.

A good idea of the condition of plant breeding in Germany, in so far as the number of breeders is concerned, can be gathered from the review written by Dr. Hillmann at the request of the *Deutsche Landwirtschafts-Gesellschaft* (German Agricultural Society) and entitled "*Die deutsche Pflanzenzucht*" (Works of the D. L. G., No. 168). According to this there were in 1910: 34 breeders of winter rye, 3 of spring rye, 61 of winter wheat, 23 of spring wheat, 5 of winter barley, 60 of spring barley, 53 of oats, 23 of mangolds, 31 of sugar-beets, 17 of potatoes, 4 of cabbages, feeding carrots, etc., 8 of clovers and grasses and 28 of pulse. Although these figures can lay no claim to absolute accuracy, yet they give some idea of the extent of plant-breeding activity in German agricultural circles, and reflect the relative importance of the different classes of agricultural plants.

We have already mentioned before reasons for the limited extent of selection carried on amongst clover and grasses, but a few breeders could soon supply the country's needs as regards the improvement of many of these forage plants (*e. g.* grasses).

If plant selection has reached its present eminence in Germany without State aid, the fact must not be overlooked that its success and far-reaching

utility are largely due to the effectual assistance of the *Deutsche Landwirtschafts-Gesellschaft*. The service which the latter has done to plant-breeding in Germany is by no means lessened by the fact that later, other agricultural corporations, unions, and associations (*Gesellschaft zur Förderung Deutscher Pflanzenzucht*, *Bund der Landwirte*, *Landwirtschaftskammern*) have worked on the same, or similar lines, for the first-named association took the lead in systematic and successful work in this field of labour. By its comparative field tests in all parts of Germany, the D. L. G. has, above all, contributed to elucidate the question of varieties, and to propagate the most valuable of these. Recently this branch of the work has been placed on a broader basis by the extension of the area for agricultural experiments through the intervention of the Chambers of Agriculture and by the establishment of smaller testing stations, mostly under the direction of scientific institutes, where the new varieties may be submitted to a preliminary sorting before proceeding to the larger field trials. These field trials of the D. L. G. have, for a long time, been supplemented by the potato-growing experiments of the *Deutschen Kartoffelkulturstation* and the barley-growing experiments of the *Versuchs- u. Lehranstalt für Brauerei* in Berlin.

Competitions for plant-breeding farms and associations have already been held ten times by the D. L. G., and have done much to promote, encourage and explain the work of selection, while the publication of the judgments passed on the various competitors has helped to distribute clear ideas as to the value of the methods and operations practised by different breeders. These competitions, which became increasingly difficult to organise as the number of breeding establishments grew larger, have been superseded by the institution of the D. L. G. *Hochzuchtregister für Pflanzenzüchtungen* (Plant-breeding Register of the D. L. G.), in which can be entered the products of systematic breeding obtained within the German Empire. By "hochzucht" is meant the product of many years' systematic selection by one breeder or breeders' association, working according to a common plan, the pedigree and performance of which product is known from a plant register or from some other breeding document.

Systematic selection consists in the selection of individuals, either *per se* or in connection with known crosses, and is based on the utilization of the continual variability of types. Every variety entered on the *Hochzuchtregister* must have a certain agricultural value based upon reliable variety trials. The entry is valid for 4 years, after which the variety must be reported and inspected in order to receive another certificate of eligibility. Being entered in the register entitles the variety to a patented label inscribed with "*Eingetragene D. L. G. Hochzucht*", which is a guarantee of its pedigree value. At present, the following are registered in the *Hochzuchtregister*: 6 varieties of rye, 9 of wheat, 7 of barley, 6 of oats, 2 of peas, 1 of field beans, 4 of potatoes, 6 of mangolds and 2 of sugar-beets.

All these regulations of the D. L. G. are made in the interests of the breeders or of the agriculturists, who obtain their seed from the former. The Inspection of Seed Production, established in 1897, is of the greatest use to

those farmers who use ordinary trade seed. This institution undertakes the examination of the condition of fields growing seed for the market, and of the arrangements made for clearing the seed, in order to determine whether the farm is capable of growing good seed, and especially whether the crops in the fields are pure-bred and of one single variety, as well as uniform and free from contagious diseases and dangerous weeds. The clearing and grading of the seed is therefore controlled by the purchaser, and recognised seed offers the buyer every security with regard to such properties as cannot be distinguished by inspection: further, the pedigree, the number of resowings from the original seed, the freedom from cross-pollination, etc., are also under control. This practice of inspection is in force now in the districts where there are chambers of agriculture or similar organizations; it is carried out either by these bodies themselves or, more usually, by special *associations*.

The character of the undertakings varies; their chief aim is to promote the production of seed of varieties suitable to the district and the adaptation of these varieties to local conditions; the results obtained vary according to the manner in which the associations are managed; they have been especially successful where practical assistance has been obtained from scientific institutes or experts. As a model may be cited the organisation in Bavaria, where all seed-producing associations are in close connection with the *Kgl. Bairischen Saat-zuchtanstalt* at Weihenstephan and are, so to speak, under its direction. A similar state of affairs occurs in Württemberg and in Baden where there are also State institutes for plant breeding: the *Kgl. Württembergische Saat-zuchtanstalt* at Hohenheim and the *Grossherzogl. Badensche Saat-zuchtanstalt* at Hochburg, which encourage seed selection by their own work together with the assistance of local organizations. In other parts of Germany, no institutes for the special purpose of plant breeding have yet been established. Here, almost without exception, the experimental and teaching institutes have included the selection of agricultural plants in their sphere of operations, thus taking the place of the State Institutes of Southern Germany. As the Agricultural Universities and Colleges instruct their students in plant breeding, both theoretical and practical, and in some places, e. g. at Jena, by submitting them to a seed inspector's examination give them an opportunity of proving that they are conversant with the principles of agricultural plant selection, the effect of such institutions upon the development of this industry is in no way to be despised. Moreover experience has proved that the decentralization of the work in this direction has great advantages. Certainly it is most desirable that some well-equipped experimental stations should be founded for the purpose of working out the principles of heredity, a clear understanding of which is of fundamental importance in practical plant breeding, for such problems can only be mastered by dint of systematic investigations requiring much labour and time, although individual effort can add its quota to the general sum of knowledge. The *Gesellschaft zur Förderung Deutscher Pflanzenzucht*, founded in 1908, exerts a considerable influence on the development of plant breeding. This society includes amongst its members practical breeders and the exponents of the different

sciences connected with plant breeding. It has successfully extended agricultural plant selection by means of various experiments and forwarded the interests of the breeders.

Thus a lively and increasing interest in the various branches of plant selection is apparent in all agricultural circles in Germany, and the results of the breeders' work receive the keenest appreciation amongst farmers, who readily turn to account the discoveries made by the experts. As a result, agricultural returns have increased and become steadier; but it is impossible to demonstrate this fact by statistics, as cultural methods have also contributed to the result. The more the success of plant selection can be made known to the peasant agriculturists, the greater will be its beneficial effect upon agriculture in Germany.

## Present State of Forestry in Portugal

by

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*Forest Legislation.* — The law of December 24, 1901, and its Regulations of December 24, 1903, mark an important step in the progress of forestry in Portugal, in virtue of the following measures:

Establishment of the principle that the receipts from the State forest are to form a special fund devoted exclusively to the cultivation, and working of the same forests and to reafforestation, leaving the State to pay the staff of the forest service.

Placing under the control of the forest service all the forests belonging to the communes, parishes and public establishments, as well as all the uncultivated lands which cannot be economically cultivated and the reafforestation of which is recognized to be of public utility.

Obliging all landowners who possess lands and forests within the afforestation area declared to be of public utility, to submit to the control of the forest service under penalty of expropriation.

Permission granted to landowners whose properties are not included

in the reforestation areas to submit *partially* to the forest service or only to the forest police service (1).

Institution of a bureau for the management of forests and for research and experimentation in forestry.

The above law is followed up by the law of May 23, 1911, which fixes at 150 reis (about 7  $\frac{1}{2}$  d) per ton, the tax on the exportation of props for mines, and provides that 70 per cent. of the yield of this tax be allotted to the special fund of the Forest and Waters Department, at the same time obliging the latter to grant yearly prizes to those teachers of primary schools who have distinguished themselves in the teaching of forestry or in organizing school or mutual forest associations.

Lastly, the recent organisation of the agricultural service of August 17, 1912, is to be mentioned. It divides the country into agricultural districts and forest belts and creates in each district an agricultural station entrusted with the study of the local agricultural conditions, the establishment of experiment fields and of alpine gardens and the spread of instruction by object lessons. In each of these stations the agents of the Forest and Waters Service play an important part.

*Direct action of the State*—The provisions of the law of 1901 have had an immediate effect upon the forest services of the State. The Department of Forests and Waters, on the strength of a guaranteed fixed annual budget, independent of parliamentary votes, has been able, since 1903, after deduction of the expenses required for the cultivation and exploitation of the State forests, to devote its revenues to the reforestation of the dunes and mountains, as well as to the improvement of waste lands and moors which the communes, through want of funds, cannot reforest.

The result has been the yearly reforestation by the State of nearly 1750 acres of waste lands situated on the mountains and on the shifting

(1) The law establishes the obligatory control by the forest service and the optional submission to the same. The control is obligatory for the State forests, for those of public bodies and even for those of private owners when they are situated within the areas of afforestation declared to be of public utility. It is optional for all private forests not situated in the above areas.

The control of the forest service is complete for the State forests, and partial for those belonging to communes and parishes and for private properties included in reforestation areas.

It is either partial or a simple forest police service for those estates which the owners voluntarily submit to forest control.

The two first, total and partial, differ from each other in the object aimed at by the systems of management, which are always submitted to the approval of the State.

The simple forest police control is less strict; it barely obliges the owner to preserve his forests and to reforest his uncultivated land in a generally sufficiently long period, without determining the extent to be reforested every year.

The advantages offered by the State to private owners submitting to partial control are naturally greater than those offered to the owners who submit only to the simple forest police control.

(Author's note).

sands of the coast, since the mission of the State is generally to undertake the most onerous work.

This constant average will increase from the year 1913, thanks to the supplement of revenue which the export duty on mine props will yield to the Department of Forests and Waters. Nevertheless it must not be forgotten that the yearly increase of the area of the forest domain entails greater outlay for planting and surveillance, and consequently the increase of the extent benefited cannot be strictly proportional to the increase of revenue.

The institution of a Bureau for forest management, research and experimentation, allowing of greater uniformity in these studies, marks a great progress from the point of view of scientific research and of the exploitation of State forests. The results of these investigations and observations are always slow in the matter of forestry; still, it is confidently believed that in one of the next forestry congresses Portugal will be able to present important studies on the maritime pine, its growth and conditions of cultivation and on the acclimatisation of exotic trees, following the instructions adopted by the International Union of Forest Research.

*Indirect action of the State.* — The indirect action of the State, which is an immediate consequence of the existing laws, takes the following forms: Supply of ornamental trees to municipalities for avenues and public parks and squares, and of forest trees to communes and landowners whose estates are under partial forest control and who may avail themselves of the services of forest officials for reafforestation and exploitation work. Landowners whose lands or woods are not comprized in the reafforestation area are allowed to submit them to the partial forest control or to the forest police service on presentation of the plans of their holdings, which plans may be made, at their request, by the forest officials. Landowners have besides the right of reserving their shooting and fishing rights and of keeping at their own expense duly sworn forest-guards appointed by the State, without being obliged to prosecute evil-doers, which is done by the State; reafforested lands are exempted from the payment of taxes for twenty years, and rewards are given to teachers of primary schools who in the course of the year, have deserved well of the forests of the country.

*Action of the Communes and of public institutions.* — Not much can be expected from the direct action of the communes, all of which are more or less short of financial resources with which to meet the expense of reafforestation. In general, and with but few exceptions, most of their landed property, which may be estimated at about five million acres, is neither cultivated nor wooded, notwithstanding the fact that from the very first years of the existence of the kingdom of Portugal, Royal Orders were incessantly issued with the object of preserving the forests and ensuring reafforestation of waste lands. Nothing has been able to prevent deforestation, due to the woodman's axe, excessive grazing and the forest fires caused by shepherds.

Only a very few communes or public bodies have been in a position since 1904 to include in their budgets the sums required for reafforestation. On the other hand the number of communes which every year requests

the State to undertake the work is constantly increasing. This has been provided for by the law which admits the following arrangements being made:

As soon as the submission of communal lands or forests to forest control has been approved by decree, as well as the plan of reafforestation or of management, the municipalities must declare within 30 days from the publication of the decrees in the Official Gazette which process of reafforestation they prefer and which may be one of the following:

1. Reafforestation and management carried out by the Forest Service at the expense of the State, the municipalities having the right to a part of the net returns.

2. Reafforestation and management carried out at the expense of the municipalities which alone enjoy the returns.

3. Reafforestation and management carried out jointly by the State and by the municipality.

Without entering into details, it will be sufficient to say that for the adoption of the first process it is indispensable that the municipalities prove that they do not dispose of the funds required to meet the cost of reafforestation; in this case the division of the net returns between the State and the municipality is made proportionally to the value of the communal land before its improvement and to the outlay of the State for reafforestation, the salaries of the officials not included.

*Private enterprise.* — The above-mentioned law has been generally well received by the owners of woods and of lands to be reafforested. Of all the advantages offered by the law, and which have been enumerated above under the heading "Indirect action of the State", those which have been most welcome are the right of shooting over the property and the protection against poachers and other marauders, for owing to want of means, the municipalities have never established a properly organized rural police, which in fact it may be said does not exist in the country.

Statistics show that since 1904 (the Regulation of the law of 1901 was not approved until December 24, 1903) the acreage of holdings submitted to forest control is already considerable: that the communal and private property submitted to partial forest control is 74 550 acres, and the private property submitted to forest police control is 259 000 acres.

The enormous difference between the acreage of private property submitted to partial forest control and that submitted to the simple police control shows that the legislators, well knowing the aversion that landowners entertain against contributing a yearly fixed sum for the purpose of carrying out plans of reafforestation or management, both duly approved by decree, have wished to lead them to engage themselves voluntarily, in consideration of certain advantages, to the conservation of their woodlands and to the reafforestation of their waste lands within a period of time fixed somewhat *ad lib.* As this is only allowed in the optional forest control, the results show that the legislators were right, in as much as they remembered that he who wants everything ends by getting nothing.

*Progress of forestry* — We must not confine ourselves only to the study of the yearly increase of the forest domain of the State and of the communal or private properties under forest control, in order to ascertain—in default of other statistical data—to what extent the wooded area of the country increases. There is also an indirect way and a very important one, namely that of the trade in the seeds of maritime pine, the applications for which addressed to the Department of Forests and Waters increase yearly in importance, while traders, in view of the greater demand for this seed, have doubled their prices.

Having no other trustworthy data beyond those which can be drawn from the applications addressed to the State, we can state that the latter has supplied this year enough seed to reafforest about 7400 acres of waste land, considering that with few exceptions the regeneration of maritime pine forests takes place naturally ever after clean felling.

Besides this important fact, it is also a matter of rejoicing that this year, on March 9, Arbor Day has been celebrated with enthusiasm by the municipalities and the teachers of primary schools, who, in the villages, have most contributed to its success. Lastly, especial mention must be made of the Association of the Lovers of Trees, which owing to the great number of its members is destined to play a great part in the forest policy of the country, as has been the case with similar associations in other countries.

*Causes of reafforestation.* — It would be a mistake to attribute all the merit of the movement which has set in in favour of reafforestation to the better comprehension of its utility, to the propaganda which has been carried on in its favour and to the action of the State. It is necessary also to seek the economic causes which have been at work. They are the enhanced value of forest products, the increased mileage of our railways and roads, the greater demands of trade and of the industries: the greater value of cork, the exportation of mine props to England, the spread throughout the country of the resin industry. These are the principal factors which have increased the value of the maritime pine forests and have attracted to them the attention of capitalists.

This forest tree is always the one preferred. It is very robust, not exacting in its cultivation, soil or aspect, thriving up to 2700 feet and reaching up to 4000 feet; it is of great value owing to the facility with which all its products can be disposed of. Such is not yet the case with Eucalyptus, the exotic tree most widely spread in Portugal: of rapid growth, attaining enormous dimensions while still very young, thriving equally well in almost every kind of soil, still the various industries hesitate to use it because its wood warps and cracks in drying and consequently it does not sell easily. *Acacia melanoxylon*, on the contrary, though more exacting as to soil and aspect and less widely spread, develops also very rapidly and is very much appreciated for carpenter's work. Both these foreign trees shoot freely from the stool.

*Forest wealth of the country.* — The following forest species constitute the stands, which cover 19 per cent. of the total area of the country. They occupy the following acreage:

Maritime pine and umbrella pine, the former prevailing . . . . .	1 909 663 acres
Evergreen oak . . . . .	898 833 "
Cork oak . . . . .	817 081 "
Chestnut . . . . .	210 345 "
Pedunculate oak, Pyrenean oak and Portugal oak . . . . .	169 150 "
	4 005 072 acres

*Geographical distribution of the forest trees.*—The valley of the Tagus, which roughly divides the country into two large agricultural regions, separates also the principal forest belts.

To the south of this river the vast region of the plains extends, in which the rains are less abundant and the climate warmer. That is the home of the oaks with evergreen foliage, which are met with on both banks of the river.

To the north is the mountainous region; its climate is not so dry, the rains being more abundant. In it maritime pine prevails, its area extending also on the left bank of the river, following its course as far as its mouth where it descends somewhat towards the south along the shores of the Atlantic. This region is also the habitat of chestnuts and of deciduous oaks. These also descend towards the south, but on the opposite side of the country along the Spanish frontier on the more broken ground and at the greatest altitude.

*Methods of forestry.*—From the cultural point of view there is nothing of great interest to be said. Green manuring and chemical fertilizers, which are already so extensively used in farming, have only been tried as experiments by the Forest Service.

The forests of maritime pine are cultivated as follows:

In the north, where property is much divided and agriculture intensive, and where the farmers use reeds as manure, the method of selection felling is the one that answers best to the requirements of the district. In the centre where the stands are denser, thinnings which are fairly well conducted are followed by clean felling in private forests when the trees are between 40 and 80 years old. In the neighbourhood of Lisbon and of the other large centres of population, selection felling is again met with in conjunction with pruning. The high prices that the branches provided with their needles fetch for baking purposes, are the cause of the choice of this method, which ensures owners a high fixed annual revenue.

Forests submitted to this system are generally divided into 4, 5 or at most 6 fellings, all of the same extent, of which one is worked every year, leaving the tops of the trees with barely 4 or 5 whorls.

When the trees are pruned, which is the chief object, selection lopping is practised, leaving aside those trees capable of producing building timber or those which are over shaded and fit only for fire wood, which commands a high price. The cover is thus kept fairly clear, so as to allow of spontaneous regeneration and of the free development of young branches.

The State forests properly managed, in view of their greater yield, are submitted to a rotation of 80 to 90 years.

The evergreen oak which elsewhere is mixed with cork oak, forms great stands, the wood and bark of which are not utilized. Its fruit supports numerous herds of swine which feed upon the acorns under its cover. It is calculated that 19 bushels of acorns of the evergreen oak are sufficient to fatten a pig, whilst it requires nearly 23 of cork oak acorns. The fattening of pigs is undoubtedly one of the principal resources of the country to the south of the Tagus.

The cork oak, the bark of which forms one of the most important branches of the export trade, is stripped of its cork every 9 to 10 years in the plains, and every 11 to 12 years on the mountain slopes.

These two oaks, the source of so much wealth and which are only fully exploited when they are sickly, are carefully tended and subjected to generally well-conducted pruning, which yields fire wood to the whole region of the south of Portugal where the growing of wheat prevails. Their reproduction is not obtained by replanting or by artificial sowing; it is left to nature and only protected by man.

Deciduous oaks are seldom seen as high forest, but mostly as coppice, and it is only mixed with other forest trees or standing isolated that some old oaks are to be met with. The coppices are cut at 10 to 12 years for tan bark and for charcoal.

Chestnuts are grown as coppice with a rotation of from 25 to 30 years. They produce wood for carpenter's work and highly esteemed staves; the chestnut shoots which are cut when the coppices are cleared furnish hoops for casks and strips for basket work, while the nuts are used as food for the people and for fattening pigs. Nevertheless chestnuts tend to disappear in Portugal, as in the rest of the Mediterranean countries.

During the last five or six years the Bureau of Forest Research has undertaken the study of the different methods of controlling the disease which destroys chestnut trees without apparent cause, and which it was believed at first would not have attacked woods situated at high altitudes.

*Exotic plants.* — A mild climate favoured by the neighbourhood of the Atlantic, favours the acclimatisation of trees of the two hemispheres.

In our parks under cover of the trees of the North of Europe and of America, under pines and Mexican araucarias, by the side of which the exuberant vegetation of eucalypti and *Acacia melanoxylon* may be admired, the tree ferns of the tropics and the palms of Africa are met with.

The Forest Department has been able to draw largely from abroad the plants required for reafforesting the highest summits of its mountain chains.

Silver fir, *Abies Pinsapo*, larch, Scotch pine, Corsican pine and birch will form the future woods at heights above 3300 feet which is the upper limit of the maritime pine, which however can be used as a fore-runner up to 4000 ft. The pedunculate oak, the Pyrenean oak and the chestnut do not usually pass this limit in good conditions of growth.

Besides these forest trees the following might be mentioned as reproducing naturally in Portugal: *Sequoia sempervirens*, Douglas fir, *Cupressus glauca*, cedar of Lebanon, deodar, Atlas cedar, and the tan acacias (*A. molissima*, *A. pycnantha*, *A. decurrens*).

*Acclimatization of exotic plants.* — The acclimatization of many exotic plants presents no difficulty in Portugal, as may be seen from the avenues of Lisbon in which *Cercis japonica*, *Sophora japonica*, Ailanthus, lime, mulberry and Indian lilac thrive. The public parks and gardens, as well as the national arboreta of Bussaco and Pena, are rich in specimens of trees of all climates.

*Work of reforestation to be carried out.* — As has already been stated the area occupied by forests in Portugal corresponds to 10 per cent. of the total area of the country, taking into account the 1 715 914 acres covered by evergreen oaks.

But if it is remembered that the stands of evergreen and cork oak are not utilized for their production of wood, that the woods composed of other kinds of trees but rarely clothe the high plateaus and the tops of the mountains, an easy explanation will be found of the bareness of the latter and of the great importation of building timber.

The result is that without any doubt the area to be reforested by the State, including the 89 000 acres of shifting sand-dunes, may be set down at about two and half million acres, unless private initiative steps in with its assistance. The accomplishment of this task, however, owing to limited resources of the budget and to the hostility of the inhabitants of the mountains, is still far off.

As for the final and economic success of the undertaking, the work that has already been done does not leave any room for doubt.

The thousands of acres of shifting dunes that have been fixed, the fine stands of pines and of native oak which clothe the slopes of the reforested mountains, and those of exotic trees which already crown the highest summits, are a convincing proof.

*Importation and exportation of forest produce.* — A comparison between the returns for 1870 and 1910 shows clearly the progress achieved by forestry in Portugal during this period.

Importation	1870 £	1910 £
Heads, staves and hoops . . . . .	76 524	168 389
Building and carpenters' timber . . . . .	57 863	185 953
Cork . . . . .	353	1 106
Various products . . . . .	—	5 578
	134 740	361 026
Exportation	1870 £	1910 £
Building timber . . . . .	32 357	206 682
Cork . . . . .	143 901	992 319
Various products . . . . .	12 291	34 000
	188 549	1 233 001

If the table of imports shows the progress of our forestry in 40 years, it shows also from a forestal point of view that we are short of oak wood, as well as of those woods required for carpenter's work and for the building of expensive houses.

On the other hand the table of exportations shows the development recently attained by the cultivation of maritime pine, which is exported principally to England, and of cork oak, which makes up, by itself, one of the chief branches of our forest wealth.

From the above, the conclusion to be drawn is that reafforestation has made considerable progress in Portugal since 1870, thanks to the increased value of forest produce and to the general economic development of the country.

But if at present a good many waste lands are yearly put under forest culture, it is no less true that an extensive field still remains open to the activity of the foresters of the future.

## **Farm Management in the United States at the Present Time: the Actual Scope of its Work, and Recent Development therein**

by

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As developed in the agricultural colleges and the national department of agriculture in the United States, farm management is that branch of agricultural science which deals with the business problems connected with farming. It is, in reality, a branch of applied economics. It may be logically divided into the following subdivisions:

1. A comparison of farming with other businesses as a means of earning a livelihood, including the advantages and disadvantages of the farm as a place of living compared with the city.

2. Preparation and training required for success in farming.

3. The method of securing a footing on the land.

4. The selection of the region in which to engage in the business of farming. This phase of the subject deals with the relation of geography to agriculture, and includes a review of soil, climatic, economic, and ethnological conditions in the various farming regions.

5. Principles involved in choosing the individual farm within the region selected.

6. The selection of the enterprises (crops, live stock, etc.) which are to constitute the basis of the farm business. This involves a study of the geographic and economic relations of all the different agricultural enterprises.

7. Farm organization. This branch of the subject deals with the principles involved in fitting together suitable enterprises in such a way as to give the most desirable distribution of labor throughout the season, to secure minimum expense in equipment and management, to secure the maximum use of equipment and to provide employment for the capital available.

8. The character, quality, and cost of equipment required for the proper conduct of the organized farm.

9. The capital required and its distribution between the factors of production on the farm. This branch of the subject also deals with the cost of production on the farm and the profits to be obtained from various farm enterprises.

10. Farm operation. The subjects which are dealt with in this branch of farm management are systems of operation, such as operation by the proprietor and his family, operation by hired labor, managerial operation by tenants, either cash or share. Each of these systems of operation is dealt with from the standpoint of its advantages and disadvantages as a means of conducting a business. Another phase of farm operation which is an important subject in farm management is the character of the lease contract between landlord and tenant when the farm is operated on a tenant system. The principal phase of this subject, from the standpoint of farm management, is the division of the profits of the farm between labor and capital. The study of farm operation also includes the subject of farm records and accounts; the management of farm labour; the care and keep of equipment; the principles of marketing, etc.

*Teaching Farm Management* — Of the forty-eight State agricultural colleges in the United States, thirty-eight are now teaching the subject of farm management, and one other states, in reply to a circular letter, that the teaching of this subject will begin next year. Thirty-six of these institutions report a total of 2575 pupils in their farm management classes. One other states that the subject is taught to all seniors, and another states that it is taught to all students in the institution.

When it is considered that the teaching of farm management as a separate branch of agricultural science is comparatively new in this country, there being only two institutions in which classes were held in this subject six years ago, it is seen that farm management is rapidly making its way into the agricultural schools of the country. We have had no satisfactory English textbooks heretofore. One good textbook has just recently become available, and another will probably be available before the beginning of the next school year. With these aids the subject will doubtless be introduced into all the agricultural schools of the country in the near future.

*Farm Management Investigations.* The United States Department of Agriculture is mainly an investigating institution. There is also in each of the forty-eight States of this country a State agricultural experiment station supported partly by funds from the national government and partly by State appropriations. The first of these institutions to begin strictly

farm management investigations was the agricultural experiment station of Minnesota. These investigations began about a dozen years ago. Shortly after that the Office of Farm Management was organized in the Bureau of Plant Industry of the United States Department of Agriculture. Extensive investigations on the subjects outlined in the first section of this paper were begun in this new office. Since its organization investigation of farm management subjects has become quite general at the State experiment stations.

Following is a list of the more important subjects of investigation relating to farm management reported by the various State experiment stations: supervision of farms; records of labor and financial transactions on farms; farm management surveys (see below); cost of operation; cost of producing corn and wheat; investigations of capital and equipment on home farms of students; the economics of dairy farming; farm home management; the economics of stock management; economic surveys of a State; price paid farmers for produce and paid by consumers in various towns in a State; influence of absentee landlord upon crop rotations, methods of management, and types of farming; management of surplus farm help in winter; use of farm teams to best advantage; systems of accounting; distribution of labor on various crops; comparative cost of production under humid conditions and under dry farming conditions; most profitable rotation systems adapted to different sections; relation of type of farming to profit; economic study of the retail milk business; cost of producing maple sugar and maple syrup; marketing of farm products; marketing of cheese; land tenure; history of agricultural production; proper amount of farming on a given area of land.

The nature of most of the above investigations is sufficiently indicated in their titles. The farm management surveys, which are becoming one of the most important phases of farm management investigations in this country, need some elucidation. In this work groups of not less than six hundred farms are studied in sufficient detail to determine the labor income of the farmer. In these studies the gross income and the total expense of each farm are determined. The labour income is then calculated by deducting from the net income of the farm interest on the capital invested and the value of unpaid labor performed by the members of the farmer's family. What is left is considered to be the labor income of the farmer himself.

One result of these studies has been to indicate that on an average the income of the farmer is sufficient to maintain the farm and its equipment, pay interest on the investment, and ordinary wages to the farmer. It is thus seen that farming compares favourably with other industries in which there is free competition and in which production is limited only by demand.

It has been found that generally speaking the size of the farm is a very important element in profit. With many exceptions it has been found to be a general rule that the larger the farm the larger the labor income. In those sections of the country where the average farm is large and where the farmer uses large teams and large machinery, the labor income rises

considerably above the average. On the other hand, in those sections where the farms are small and where the farmer uses small teams and implements, the average labor income is below the average for the country. It would be interesting to know whether these conditions hold in other countries than the United States.

## Work of the Observatory of Phytopathology in Turin

by

Piùt PIERO VOGLINO,

*Director of the Observatory*

With the object of enabling Piedmontese farmers to know the diseases that attack cultivated plants and the means of controlling them, the President of the Agricultural Association of Turin took the initiative of an Association for the institution of a district phytopathological observatory. The Ministry of Agriculture, the Savings Bank, the Municipality, the Charitable Foundation of St. Paul, and afterwards the Chamber of Commerce of Turin, answered the invitation. At a meeting of the representatives of the above bodies a Statute and Regulations were discussed and approved. In December 1908 the Council of Administration of the new Institution met under the presidency of Count Rebaudengo. The Observatory began to work regularly on January 1, 1909 under the name of "Osservatorio Consorziiale di Fitopatologia" and with the aim of exerting a strict surveillance on the plants cultivated in the district, with the objects of: 1. informing the public every month of the appearance of harmful parasites and other dangers to plants, at the same time forwarding a list of them to the Ministry; 2. studying the causes of the diseases and pointing out in due time the best means of control; 3. spreading among farmers, by means of meetings, discussions and practical lessons, to be held in several localities, practical notions on plant diseases and their control; 4. instituting, with the farmers, experiment fields for the control of the more widely-spread plant diseases; 5. watching over, in respect to diseases and if requested by the Municipality, the public gardens and avenues of the city of Turin and applying, where advisable, the proper means of control; 6. examining suspicious mushrooms if requested to do so by the Bureau of Hygiene; 7. giving verbal or written consultations to farmers of the district and paying visits to the various localities; 8. attending to the institution of a special Museum of vegetable Pathology; 9. presenting in the first quarter of each year a comprehensive report on all the work done and the progress of the observatory during the preceding calendar year.

The institution was hailed with enthusiasm, but before the full utility of the Observatory could be established it was necessary to allow a certain period of time to elapse:

The constant requests for visits, the abundance of material sent or brought for examination, the numerous consultations, and the frequent visits to the Museum, show the lively interest that farmers take in the institution and that they recognise the advantages they can reap from it. The Observatory has marked in Italy a considerable progress in the control against parasites. The real utility lies in the touch between the farmers and the pathologist, so that when the natural mistrust has worn off the tiller of the soil gains confidence in the man who gives him exact notions on the causes of the diseases which attack plants, and on the means of controlling them. The farmer knows that there is an institution directly responsible for the prevention of the spreading of plant diseases.

In every commune of the province of Turin, the Observatory has two, four or six local observers, who are selected from among the most willing farmers, under the guidance of a head local observer. They can easily point out the various diseases and communicate to their neighbours the practical advice sent out by the Observatory. In order to facilitate sending away specimens, in every commune there is a depot of special tin boxes.

Thus the local observers, who are upwards of 500, report carefully even the slightest signs of disease in plants, and forward abundant material; thanks to their assistance the Observatory was able to discover the causes of much mischief in the province of Turin and in several other parts of Piedmont. In the Bulletins, which are published monthly, and in which lists, are drawn up of the various plant troubles reported together with the practical advice tendered, account is given of the following work: 1511 examinations of plants, 816 visits, 88 meetings, and a correspondence numbering 2405 letters, in 1910; in 1911 the examinations were 1537, the meetings 92; 850 farms were visited and 3083 letters written; in 1912: 1752 examinations, 973 visits, 85 meetings and 3220 letters.

There is a constant increase in the number of visitors to the Museum, in which a great number of specimens of the diseased plants that have already been investigated, and of the parasites which affect them are collected, and it is encouraging to see that the practical farmer examines with attention the various specimens which show the development of the parasitic plant pests and how he understands the necessity of certain methods of control.

The development of some fungi and insects hitherto imperfectly known has been followed not only by means of the specimens collected at different times and in several places, but also by microscopic examinations and by special laboratory cultures.

The Observatory, considering that its chief objects in view are investigations on the diseases of plants and their remedies and the practical application of the same, has conducted numerous experiments with various substances against the most injurious parasites, endeavouring always to render the treatment as simple as possible, considering the scarcity and high price of labour. Of the many specifics sent to the Observatory for recommendation, only those of which the composition was declared were taken

into consideration, and handed over to expert farmers to be tested under the surveillance of the Observatory.

In order to popularize the use of remedies and cures the effect of which is certain against some widely spread diseases, every year communal competitions are held and special prizes are awarded by the Observatory, the Ministry of Agriculture, the Royal Academy of Agriculture of Turin, the Turin Agricultural Association (Comizio) and other bodies.

A brief sketch is here given of the principal scientific results obtained by the study of several fungus forms. In 1904 the following were specially observed: The presence of *Taphrina bullata* Bel. with organs of fructification on pears; the prolonged presence of large conidia of *Phyllactinia corylea* and the formation of epipectic hyphae of the perithecia; the development as a true parasite of *Phyllosticta maculiformis*, equal and even superior to that of the *Cylindrosporium castanicolum* form; a very remarkable development in length in the branches of hornbeam affected by *Melampsora Carpinii* (Nees) Fuck.; the greater secretion and consequent formation of a greater number of cystids in the leaves of *Celtis australis* affected by *Eyroceras Celtidis* (Br.) M. et C., and abnormal development in the cellular tissue of the branches; three new species of fungi. The observations of 1905 embraced: The distinct parasitism of *Stereum frustulosum* and of *Daedalea quercina* on oak; the passage of *Phyllosticta prunicola* in hyberating form, on to the branches of plums; the very disastrous infection of *Gloeosporium Platani* = *Gl. nervisequum* caused by excessive humidity; the identity of *Pyricularia Oryzae*, of *P. parasitans* and of *Dactylaria parasitans* with *D. grisea*; the identity of *Cercospora hypophylla* with *C. Rosae-alpinae*; four species and two new forms.

In 1906 the following were observed: marked characters of *Peronospora* shown by *P. cubensis* with extraordinary development of the mycelium, and presence of haustoria in the epidermal cells of the leaves of cucumbers, as well as oospores in the leaf-tissue; parasitism of some species of *Pylyporus* and of *Collybia velutipes*; resemblance between *Phyllosticta Bolleana* and *P. Evonymi*; *Sphaerella hedericola*, ascophorous stage of *Septoria Hederae*; *S. Campanulae* = *S. Trachelii*; presence in Italy of *Dothichiza populea* Sacc. and its parasitism on *Populus canadensis*; reference of *Vermicularia trichella* and *V. circinans* to the genus *Colletotrichum*; *Marsonia Potentillae* = *Gloeosporium Fragariae*; two new forms: *Phyllosticta Ribis-rubri* and *Septoria Soldanellae* var. *pyrolaeifolia*.

Notable are the results obtained in 1907, namely observations on: the marked parasitism of *Pythium* on the roots of *Centaurea*, the formation of coridiophores with conidia about the collar of the infected plant and of numerous oospores in the dead tissues; the parasitism of *Phragmonaevia lactissima*; reference to *Ascochyta hortorum* of *Phyllosticta hortorum*, *Phoma Solani*, *Ascochyta Lycopersici*, *A. socia*, *A. solanicola*, *A. Atropae*, *A. Alkekengi*, *A. pedemontana*; *Septoria Leucanthemi* parasite of cultivated species of *Leucanthemum* and *Pyrethrum*, with spores 100 to 130  $\mu$  in length and 4 to 5  $\mu$  wide, with 12 to 14 transverse septa; seven new forms: *Phyllosticta Balsaminae* parasite of *Balsamina*, *Pyrenochaeta Centaureae* on

*Centaurea candidissima*, *Septoria foetida* on *Datura Metel*, *S. longispora* on *Phlox Drummondii*, *S. Limnanthemii* on *Limnanthemum nymphoides*, *S. Aderholdii* or *Centaurea candidissima*, *Colletotrichum aspidinum* f. *ramicola* on *vire cares*.

From the study of fungus forms in 1908 it was observed that: *Oidium farinosum* = *Sphaerotheca pannosa*; *Gloeosporium Trifolii* = *G. caulivorum* = *Pseudopeziza Trifolii*; *Ascochyta contubernalis*, *A. pucciniophila* and *Phyllosticta pucciniophila* = *Darluka Filum*; presence of *Cytospora Celtidis*, *Colletotrichum Grossulariae*, *Alternaria Violae* and *Oidium quercinum* in Italy; two new forms of *Botrytis*, viz f. *Ocimi* and f. *Punicae*; four new species: *Phomopsis populina*, *Ascochyta Phlogis*, *A. Eriobotryae* and *Leptothyrium Paeoniae*.

In 1909, together with the parasites already noticed in the preceding years, some new forms were observed, namely: *Peronospora Viciae* widely spread in the mountains on the leaves of peas and of *Orobis vernus*; *Sclerotinia Libertiana* on chevil; *Oidium leucoconium* on green and dry peach branches and on almond fruits, and the perithecial form, *Sphaerotheca pannosa*, on rose and apple trees. Among new forms: *Sclerotinia Ocymi* on basil; the ascophorous form (*Cenangium populneum*) of *Dothichiza populea*; the probable reference of oak mildew with *Oidium ventricosum*; *Botrytis parasitica* var. *Colchici*, *B. cinerea* f. *Dianthi*.

In 1910 the following observations were the most important: *Bremia Lactucae* Reg. or *Dimorphotheca*; *Sclerotinia Libertiana* Fuck. on *Scorzonera*, *Helianthus* (sunflower, Jerusalem artichoke), *Daucus Carota*, *Brassica* (cabbage and cauliflower), *Solanum*; the perithecial form of *Sphaerotheca pannosa* Lév. on peach twigs; *Rosellinia radiciperda* M. on apple trunks; *Gibberella moricola* (De Not.) Sacc. injurious to young mulberries; *Gloeosporium fructigenum* Berk. on pears; *Gl. lagenarium* (Pass) Sacc. on cucumbers; *Scolecotrichum melophthorum* Prill et Del., very injurious to pumpkins; and two new forms: *Botrytis parasitica* f. *Armeriae* and *Ramularia Doronici* Vogl.

Important observations made in 1911: *Lophodermium Pinastri* (Sch.) Chev. and *L. laricinum* Duby, on Scots pine and on larch; *Nectria ditissima* in a new form on apple trees; *Gibberella Saubinetii* (Mont.) Sacc. on wheat; *Coniothyrium Fuckelii* Sacc. on pear trees; *Ascochyta Cannabis* (Speg.) Vogl. = *Phyllosticta Cannabis* Speg., on hemp; *A. Begoniae* (Fl. Tassi) Vogl. = *Phoma Begoniae* Fl. Tas., on begonias; *A. pirina* Peglion on pear trees; *A. piricola* Sacc. on white beam; *Colletotrichum Lindemuthianum* (Sacc. et Magn.) Br. et Cav. and *Scolecotrichum melophthorum* Prill. et Del. on young haricot plants; *Cladosporium Heliotropii* Eriks. on heliotrope; *Macrosporium Solani* Ell. et Mart. on tomatoes; and three new species: *Sphaeronaema parasiticum* Vogl. on the leaves of *Crataegus glabra*, *Coniothyrium opuntiae* Vogl. on branches of the prickly pear, *Ascochyta laricina* Vogl. on the shoots of larch. In 1912 the following were observed: a bacteriosis of Oleanders; the disastrous parasitism of *Phytophthora Cactorum* on the stems of *Capsicum annuum*; *Pythium de Baryanum* parasitical on the roots of beans; *Sphaerella Vulncrariae* on the leaves of *Anthyllis Vulne-*

*raria*; *Rhizoctonia violacea* on chards or sea-kale beets and on parsley; the extensive and disastrous infections of *Ophiobolus graminis* Sacc. on wheat; *Cladosporium fulvum* var. *violaceum* on tomato leaves; *Ascochyta hortorum* injurious to the egg-plant and to capsicum, and some new species.

Among animal parasites the development of several species of *Hypnomena* and of *Carpocapsa* was followed and the means of control were taught.

In almost all the mountain valleys the leaves of larches were injured by *Coleophora laricella* and in the plains the plane trees by *Lithocolletis platani*.

In market gardens cabbage butterflies (*Pieris*) and cabbage moths (*Mamestra*) caused much mischief, *Polya dysodea* damaged lettuces and *Acrolepia assectella* leeks.

On fruit trees some very injurious Coleoptera were observed, such as *Otiorrhynchus*, *Anthonomus* and *Magdalis*; on the Canada and Carolina poplars, especially in young trees and in nurseries, the leaves in spring were often found rolled up or damaged by *Rhynchiites* and by *Lina populi*. The leaves of elm trees are often infested by *Adimonia xanthomeleana*. On cereals *Zabrus gibbus* and *Agriotes lineatus* were studied; in many gardens *Lema lilii* devoured the leaves of the lily. As for Hymenoptera, the damage done to apple, plum, pear and currant by *Hoplocampa fulvicornis*, *Nematus ribis*, *Calyroa limacina* and *Lyda pyri* was observed. *Croesus septentrionalis* was found rather widespread on Canadian poplar. Several Diptera injured vegetables: *Phytomyza* on carrots and colza, *Aricia* on beets and on spinach, *Acidia heraclei* on celery. Among Hemiptera many species of *Aphis* and *Lachnus* have been observed and combatted on several vegetables, on roses, *Robinia* and *Sophora*. Very widely spread and injurious are *Hyalopterus pruni* on peach and *Schizoneura lanigera* on apple.

*Chionaspis evonymi* has now invaded almost all spindle trees; *Mytilaspis pomorum* tends to spread on the stems and branches of Canadian poplar notwithstanding the fact that some parasitic acari, *Emisarcoptes*, *Encyrtus*, *Eremus minimis*, and several Hymenoptera, *Habrolepis zetterstedti*, *Aphelinus mytilaspidis* and *Phycus* sp. devour its eggs.

*Diaspis pentagona* was also found to be very widely spread, occurring on a great variety of trees and herbaceous plants.

Among acari, *Tetranychus* on vine, horse chestnut, haricots, etc., was found in many places causing drying up of the leaves. *Phytoptus* on fruit trees and *Pentaleus major* in market gardens, damaging beets, peas, pumpkins, etc., were also discovered.

The scientific observation of the life history of animal and vegetable parasites led to the publication of the "Enemies of the Canadian Poplar" and the yearly publication (begun in 1904) "The plant-parasites observed in the province of Turin and neighbouring districts", besides other notes and memoirs published by the staff of the Observatory.

The problems connected with the diseases of plants, and especially their control, are very complex.

It is not always possible to make use of the best remedies, owing sometimes to the difficulty of applying them, at others to their price being

higher than that of the produce of certain crops. The Observatory is investigating some means of natural defence, such as growing resistant varieties, or the introduction of parasites which live at the expense of the injurious ones.

Some good result has already been obtained, as is proved by the confidence shown by the farmers in the Observatory; which will continue on its course supported by the knowledge that it is contributing to the welfare of the agriculture of Italy.

## Work of the Phytopathological Section of the Central Agricultural Experiment Station in Stockholm in 1912

by

PROF. JAKOB ERIKSSON,

*Chief of the Section.*

1. *Work on potato diseases.*—In contrast to 1911, when potato disease (*Phytophthora infestans*) hardly showed itself in Sweden, the season of 1912 seems to have been particularly favourable to the free development of this fungus. In this year the disease began to appear earlier than usual. The first reported case was on the 9th of July from a place in Östergötland. A week earlier, however, it had been noticed in a potato plot in a garden. In Scania, the disease was found near Malmö on the 17th of the same month. As the disease had occurred at such an unusually early date, the attention of growers was drawn to the subject by a communication to the papers, stating the advisability of immediate spraying with Bordeaux mixture wherever possible. A leaflet on the subject was also got out at once, entitled "Bespritzning med Bordeauxlösning" (1) (Leaflet No. 35, July 1912). In this, instructions were given for preparing and applying the mixture. It was only during August that it seemed that the apprehensions of a year of serious disease had been exaggerated: in many places, such as about Stockholm, the potato haulm remained healthy well on into September. All the same, the apprehensions were in the end justified: when the crops were lifted, reports came in one after another from nearly all over the territory, including Scania, to the effect that the potato crops were much reduced by the disease.

Spraying had been carried out in various parts of the country: in all cases the results were remarkably good, although the sprayings were made very late (the first not till after the appearance of the disease).

(1) "Spraying with Bordeaux mixture".

(Ed)

In August a species of fungus, *Hypochnus Solani* Prill. et Del., hardly known before as harmful, appeared in several places, doing most damage at Tranås (Småland). The disease began on the lower parts of the stalks and appeared as a very dense whitish grey coating, reaching to 1 ½ or 2 inches above the ground, and stopping at the point of insertion of the lowest leaf. This whitish coating consisted of a mycelium of branched and septate hyphae. Below the soil this coating became darker, of a brownish colour, and extended onto the stolons and roots, where it became still darker and more compact, here and there producing sclerotia. These sclerotia, which were black, were found to belong to the species long known as *Rhizoctonia Solani* Kühn. During the year, an article on this disease was published under the title of "Filtsjuka å Potatis (*Hypochnus Solani* Prill. et Del.)" (1).

But the year 1912 will be recalled as a particularly serious one for the future of potato-growing in Sweden in that it saw the discovery in the country of the new and destructive disease known as "black scab" (*Chrysophlyctis endobiotica* or *Synchytrium Solani*), which has developed to an alarming extent in Great Britain during the last ten years. It is also firmly established in Germany, where it seems inclined to spread.

This disease was found on the 2nd of October, first in the garden of a house in the Stockholm archipelago (on the island Ljusterö) and soon after on a farm in Södermanland (near the railway station of Järna); it also occurred on some land belonging to the Agricultural Labourers' Benevolent Society, and lastly in a garden and neighbouring field about half a mile away from this land. From the investigation made, it appears that the centre of infection was the farm at Järna. The disease had established itself in 1910 or 1911, having been introduced in empty sacks sent by a salesman in Stockholm, who bought potatoes from this farm as well as from Germany, to sell in Stockholm. The disease was introduced into the garden in the Stockholm archipelago by seed potatoes which had come from the farm mentioned. The infected land amounted to about 14 acres, while the potatoes diseased comprised some 300 tons.

As soon as the disease was discovered, the authorities were informed; and a grant was asked for, first for the destruction of the diseased potatoes and for compensation to the growers under this head, and further for the disinfection of the soil in which the diseased crops had grown. For these two purposes the Swedish Government made an allocation of 4000 crowns (about £220). The diseased crops were destroyed as follows: the potatoes were thrown into a large trench opened for the purpose and petroleum was thrown over them; the trench was then filled in. The diseased land was treated by watering with 1 per cent. formalin solution, at the rate of about 2 gallons per square yard.

To prevent the disease being introduced into other places, a proposal was brought forward to prohibit all importation of potatoes; but the Government has yet to come to a decision on this matter.

2. *Work on beet diseases.* — Researches carried on for several years on beet diseases in Sweden led to the publication of an article on the subject in 1912. This is entitled "Svampsjukdomar å svenska betodlingar" (1); it deals with the following diseases: *Uromyces Betae* (Pers) Kühn, *Bacillus tabificans* Del., *Rhizoctonia violacea* Tul., *Phoma Betae* Frank, *Cercospora beticola* Sacc., *Sporidesmium putrefaciens* Fuckel, and others.

A short study on *Rhizoctonia violacea* on beets, as well as on carrots, turnips and kohlrabi, was published under the title "Etudes sur la maladie produite par le Rhizoctone violacé" (2) (*Revue générale de Botanique*, Vol. 25, p. 14). It has been found that the reddish fur which develops on the roots of these plants, at any rate that occurring on carrots, constitutes a sterile stage of a species of *Hypochnus*, which develops more fully on various other plants, e. g. chickweed (*Stellaria media*), *Erysimum cheiranthoides*, and sowthistle (*Sonchus arvensis*); all of these occur as arable weeds in the root-growing districts. The spore-bearing stage is named *Hypochnus violaceus* (Tul.) Erik. This fungus therefore shows a sort of heteroecism.

3. *Work on the withering of flowers of fruit-trees.* — An account of the researches on this disease, also carried on for several years, was published in 1912 under the title "Om blom- och grentorka (*Monilia-torka*) å våra fruktträd" (3), as well as in German under the title "Zur Kenntnis der durch *Monilia* Pilze hervorgerufenen Blüthen- und Zweigdürre unserer Obstbäume" (*Mycologische Centralblatt*, Vol. 2, p. 65). In this work, a point mentioned as of special importance for growers is to treat for the stage of development corresponding with the very first period of the fungus; in this stage it forms little grey pustules on the fruit-spurs and twigs, which may remain after the previous year's attack; the treatment should be carried out before the leaves open. These pustules contain the first generation of spores of the new year, and it is from them that the fruit and wood buds get infected soon after. It is of primary importance to get rid of these first centres of infection; this can be done by an early cutting-out of all dead wood, or by spraying the whole tree with 2 per cent. Bordeaux before flowering.

4. *Observations on diseases of vegetables.* — During 1912, a number of diseases occurred on horticultural plants of different sorts and were much discussed: many of them were new for Sweden. They were fungus diseases of cucumber, French beans, tomato, asparagus, rose, hyacinth, etc.

Among the researches into these diseases, only those on cucumbers and melons are so far ready for publication. A summary of these, under the title "Svampsjukdomar å svenska gurkväxtodlingar" (4) is in the press. The following fungi causing diseases are described: *Cladosporium cucumerinum* Ell. et Arth., *Cercospora Melonis* Cke., and *Colletotrichum lagenarium* (Pass.) Ell. et Halst.

(1) Fungus diseases of Swedish beet crops. (Ed.).

(2) Studies on the disease produced by *Rhizoctonia violacea*. See No. 426, B. April 1913.

(3) On the withering of blooms and twigs (*Monilia*-withering) in our fruit trees. (Ed.).

(4) The fungus diseases of Swedish cucumber crops. (Ed.).

As the results of many of these investigations point to the seed as the source of the disease, a leaflet was published entitled "Tillvaratag från från friska kulturer!" (1) (Lauflet No. 36, Aug. 1912).

5. *Examination of samples of diseased plants received at the Institute.*— In 1912, 515 samples were sent in; all were examined and reported on.

6. *Various work.*— Besides those mentioned above, the following publications appeared during 1912: "Fungoid Diseases of Agricultural Plants" (London: Baillière, Tindall and Cox, pp. XV + 208.)— "Ueber *Exosporium Ulmi* n. sp. als Erreger von Zweigbrand an jungen Ulmenpflanzen" (*Mycol. Centralblatt*, Vol. I, p. 35). — "Rostige Getreidekörner, und die Ueberwinterung der Pilzspezies" (*Centralbl. f. Bakt.*, Abt. 2, Vol. 32, p. 453). — "Krusbärsmjöldaggen i Sverige juni 1912" (2) (*Svenska Dagbladet*, July 8, 1912), and "Krusbärsmjöldaggen under juli månad" (3) (*Svenska Dagbladet*, Aug. 25, 1912).

At the International Congress of Comparative Pathology held in Paris from the 17th to the 23rd of October, 1912 a report was printed entitled "Que faire pour éviter les maladies propagées par les graines et les arbres des pépiniéristes?" (4).

(1) Save seed from healthy crops. (Ed.).

(2) American gooseberry mildew in Sweden in June, 1912. (Ed.).

(3) American gooseberry mildew in July. (Ed.).

(4) What can be done to avoid the spreading of diseases by seed and trees from nurserymen? (Ed.).

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SECOND PART.  
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

766 - Agriculture in Modern Greece. — MARESCH, O. R., in *Österreichische Agrar-Zeitung*, Year 4, No. 15, pp. 174-178. Vienna, April 12, 1913

The total area of Greece is 15 978 750 acres; this consists of:

Cultivated land . . . . .	3 532 000 acres, or 22.10 per cent.
Meadow and pasture . . . . .	4 990 000 » » 31.22 »
Forest . . . . .	2 025 500 » » 12.67 »
Waste land . . . . .	5 431 250 » » 34.01 »

DEVELOPMENT  
OF AGRICUL-  
TURE IN  
DIFFERENT  
COUNTRIES.

The high percentage of waste land is explained by the circumstance that two-thirds of the area is either mountainous, and therefore only to a limited extent available for agriculture, or else too poor to be remunerative as arable land. Therefore other forms of cultivation are gradually gaining ground, such as olive groves, vineyards, vegetable gardens, etc., since the dry climate is suitable for deep-rooted plants (especially vines and tobacco), and because the extreme subdivision of the land, the deficiency in capital and credit, together with the low rate of wages, lead to the cultivation of those plants which, though they require more labour, yet fetch a higher market price.

The average size of the mountain holdings is from 1  $\frac{1}{4}$  to 2  $\frac{1}{2}$  acres, while in the plain the farms run from 12 to 25 acres, and in Thessaly their extent is 250 acres or more. On the mountains wheat is usually taken after two or three years' fallow, while on the plains a simple three-crop rotation is practised.

Agricultural machines are of rare occurrence and it is only of late years that the old Hesiod plough has been replaced by better implements of Central European manufacture.

Manuring leaves much to be desired; artificial fertilizers are very seldom

employed. The regulation of irrigation is also much neglected. Grain is threshed by animals treading it out.

Greece does not produce two-thirds of the 10 million bushels of wheat which it requires to supply its needs; though the million and a half bushels of barley grown supply the demand. The production of home-grown pulse is also inadequate. The annual maize crop is about  $2\frac{1}{4}$  million bushels and the rice harvest is sufficient to supply the country. Potatoes are exported to a small extent. About 18 500 acres are under tobacco, producing annually about 190 000 lbs. of tobacco of excellent quality. Cotton-growing is increasing in importance.

In good seasons the vineyards produce an average of 88 million gallons of wine. The must is trodden out in a very primitive manner in rectangular walled-in pits. Next to cereals, dried currants are the most important product. About 116 000 acres are devoted to the vines producing them, and the value of the annual yield varies from £1 250 000 to £1 660 000. The net return from currant cultivation is often 8 per cent. of the capital expended.

Olives are grown throughout Greece, but little care is given to the trees. The cultivation of Southern fruit (oranges, lemons, figs, etc.) is much neglected. Lately, vegetable growing has made considerable progress and is a fairly good source of revenue, both to the islands and to the south-eastern portion of the mainland.

Cattle breeding does not form an independent branch of agriculture in Greece, for cattle are mostly kept for the purpose of turning the arable land to account. Horse breeding is at a very low ebb as there is a deficiency in capital and in good grazing ground. Amongst the native breeds of horses are to be distinguished the Skyros and Pirios; both are small, thrifty and sure-footed. On account of the scanty supply of fodder, many more donkeys and mules than horses are bred.

Cattle are chiefly bred for draught, the production of milk and meat being quite a secondary consideration. Among the native breeds are: 1) the so-called Greek breed, distinguished by its light frame and the fine flavour of its meat; 2) the Macedonian, which, except for being somewhat smaller, possesses all the characteristics of the Steppe cattle; 3) the polled Syrian breed.

Greek sheep are noted for thrift and hardiness; in order that they may not lose these characters, they are not interbred with milk and mutton producing animals. The output of wool is negligible and the quality inferior. There are two indigenous breeds, the Greek or so-called peasant sheep, and the island breed. The former have thick long, pendant and usually dark-coloured wool, while the latter breed produces finer wool and is more exacting in its requirements.

Goat breeding is much developed; there are over 3 million head of these animals, or 80 per square mile.

Bee-keeping is a very ancient Grecian industry, and is especially common in the Cyclades. The annual production amounts to about 1000 tons of honey and 90 tons of wax.

767 - The Extension of Plantations in the German Tropical Colonies. — SCHULTE IM HOPE, A. in *Deutsche Kolonial-Zeitung*, Year 30, No. 21, pp. 346-347. Berlin, May 23, 1913.

The writer estimates the capital at present invested in plantations in the German colonies at about £. 5 000 000. The areas brought under cultivation in the years 1907, 1908 and 1911 were, for the various crops, as follows :

*Rubber plants*

	1907	1911
East Africa . . . . .	12 479	81 450
Kamerun . . . . .	5 142	17 745
New Guinea . . . . .	4 376	5 812
Samoa . . . . .	1 510	2 130
Togo . . . . .	237	405
	23 744	107 542

*Coconuts.*

	1908	1911
New Guinea . . . . .	48 367	62 430
East Africa . . . . .	15 538	16 818
Samoa . . . . .	9 425	11 587
Togo . . . . .	1 433	1 433
	74 763	92 268

*Sisal Hemp.*

	1907	1911
East Africa . . . . .	25 588	52 721
Togo . . . . .	74	324
New Guinea . . . . .	86	220
	25 748	53 265

*Cotton.*

	1908	1911
East Africa . . . . .	15 182	35 356

*Cacao.*

	1907	1911
Kamerun . . . . .	18 961	26 327
Samoa . . . . .	3 754	5 392
New Guinea . . . . .	555	1 021
Togo . . . . .	230	371
East Africa . . . . .	247	247
	23 747	33 358

*Coffee.*

East Africa . . . . . 7 164

7 166

The following table shows the total area under cultivation, the number of white employees and the number of coloured hands in each colony.

1911	Acres under cultivation	White employees	Coloured hands
East Africa . . . . .	202 212	557	60 835
New Guinea . . . . .	69 670	182	13 742
Kamerun . . . . .	49 420	147	13 272
Samoa . . . . .	20 641	78	2 053
Togo . . . . .	2 647	8	536
Total in 1911	344 590	972	90 438
„ „ 1910	311 637	811	81 340
„ „ 1909	243 763	731	66 968
„ „ 1908	210 327	591	52 085

On account of the present shortage of labour in Kamerun and East Africa it need not yet be concluded that plantations have reached their limit of extension. The shortage of labour is rather due to the incomplete development of the railways, which causes about a half of the available labour to be engaged in carrying the produce to or from the interior and the coast or to the railway stations; this labour is thus withdrawn from productive work. Only through further extensions of the railways will the shortage of labour be avoided and new plantations rendered economically possible.

EDUCATION  
AND EXPERI-  
MENTATION IN  
AGRICULTURE  
AND FORESTRY

768 - **The Promotion of Agricultural Instruction and Experiment in Switzerland by the Union, in 1912.** — *Bericht des eidgenössischen Handels-, Industrie- und Landwirtschafts-Departments über seine Geschäftsführung im Jahre 1912: III. Abteilung, Landwirtschaft, pp. 2-10. Bern, 1913.*

In 1912, 14 students of the agricultural division of the technical College at Zürich received a total grant of £170 13s from the Union. There are at present in Switzerland four Agricultural Schools which are open throughout the year (Strickhof-Zürich, 63 students in 1912; Ruti-Bern, 70 students; Ecône, Valais, 24 students; Cernier Neuenburg, 57 students), 15 winter-schools (992 students) and one Cantonal Horticultural School (at Geneva, 41 students).

The Union paid the Cantons half the educational expenses, which in 1912 amounted to £2286 3s for the whole-year schools, £5079 19s 3d for the winter schools, and £636 7s for the Geneva Horticultural School, or a total of £7992 9s 3d. The Intercantonal Fruit, Vine and Horticultural School at Wädenswil, which has 12 students, received a grant of £383 10s from the Union.

Further, the Union defrayed half the expenses (£1698 18s 6d) incurred by 15 Cantons for agricultural lectures and courses, and for experiments on cheese-making, stall-feeding and manuring of pastures. Six Cantons

had half their expenses for vineyard experiments paid, the sum granted amounting to £957 16s 8d.

The Union supports three Agricultural Chemistry Institutions (Zürich, Bern, Lausanne), two Seed Control Stations (Zürich and Lausanne), and one Dairy and Bacteriological Experiment Station at Liebefeld in Bern. Last year these institutions carried out 2057 field experiments, 53 vineyard experiments and 522 pot experiments, as well as 28350 other investigations (concentrated feeds, fertilizers, soils, milk, seeds, etc.) in the laboratory. The Dairy Institute at Liebefeld has provided cheese factories with 4959 pure cultures for the preparation of rennet. The total number of experiment stations cost the Union £16934 8s, which must be set against receipts amounting to £4393 16s.

The Swiss Experiment Station for Fruit, Vines and Horticulture at Wädenswil, with an income of £831 9s and expenses amounting to £4449 2s, required a contribution of £3617 13s from the Bank of the Union. The Station, in addition to experimental work, holds short courses on fruit and vine growing, which were attended by 503 students.

Three Cantons (Bern, Freiburg and Vaud) have dairy schools, with a total of 121 students. The Union defrayed half the cost of these, which was £1349 17s.

769 - **The Study of the Science of Rural Administration at the Berlin Agricultural College.** — FRNK, E. Von den landwirtschaftlichen Abteilungen der Hochschulen. — *Landwirtschaftliche Umschau*, Year 5, No. 15, pp. 355-356. Magdeburg, April 11, 1913.

The Berlin Agricultural College (*Landwirtschaftliche Hochschule*) has organized for the present summer term, a special course of instruction in the Science of Administration in order to supply the necessary information on this subject to persons intending to qualify for entrance into the service of the Chambers of Agriculture, or similar bodies, or of large agricultural corporations, associations, etc., or to become agents and managers of large estates or agricultural-technical undertakings.

The course lasts two sessions and a special examination can be taken at its conclusion, which is optional and is regarded as supplementary to the examination for the agricultural diploma, or certificate of instructor in agriculture. The curriculum includes lectures on the following subjects, which are supplemented by practical work in the College.

1. The principles of national and communal administration.
2. Rural administration.
3. Civil law.
4. Finances.
5. Insurance: social and private insurance.
6. Selected chapters of agricultural policy.
7. Cooperation in its relation to agriculture; organisation and present conditions of agricultural cooperation in Germany.
8. The use of cooperation in agriculture; its principles, history and different forms.
9. The technique of cooperative administration, including the administration of cooperative unions.

10. The law of cooperation.

11. The principles of commerce : the general principles of commerce and their application to rural economy. The principles governing wages, credit and Stock Exchange operations.

770 - **The Teaching Method in the Provincial School of Agriculture and Cattle Breeding at Ath, Belgium.** — LONAY, ALEX. in *Annales de Gembloux*, Year 23, Part 4, pp. 198-199. Brussels, April 1, 1913.

The method of instruction adopted in the Ath Provincial School of Agriculture and Cattle Breeding is the so-called direct or "active" method, by which the student learns chiefly by his own exertions : he is required to test all he hears from his teacher by reference to nature, if possible, or else by having recourse to photographs and drawings, etc ; he must accustom himself by practice to measuring, valuing and calculating, as well as to estimating the age, value and defects of animals, the condition of land and of crops, and the comprehension of leases, contracts for buying and selling, as well as the formulae used in analyses.

In order to make it possible to practise this method of instruction, the plan of study is not divided, as is customary, into hours, but into half days. The lecturers on farm crops and animal husbandry are required to demonstrate from the crops and animals on the land and at the homestead, instead of following the usual text-book methods.

The lectures on the principal branches of agriculture (tillage, crop cultivation and the science of breeding) also give instruction in the preliminary scientific subjects ( physics, organic and inorganic chemistry, mineralogy, geology, botany, zoology and bacteriology). In this manner, the students, while not going into unnecessary details, acquire a sufficient knowledge of pure science to enable them to understand thoroughly the chief branches of their work. Every instructor is also required to explain the working of the machines and the use of the implements employed in the branch of agriculture treated by him. Finally, they must treat different branches from the economic standpoint, as well as from the technical side, so that the students can from the beginning have a right idea of rural economics.

In order that this method may be satisfactorily carried out, the instructor must have been trained for the purpose and be provided with suitable and abundant material. Each Chair is provided with an assistant (assistant lecturer), whose duty it is to prepare the material required.

771 - **Rural Continuation Schools.** — KOLATSCHKE, A. W. in *Österreichische Agrar-Zeitung*, Year 4, No. 13, pp. 145-148, Vienna, March 29, 1913.

Rural continuation schools have been established for the purpose of giving to the greater majority of peasants' sons, who are unable to attend an agricultural school, the opportunity of retaining and extending, by means of at least a few hours' instruction in the week, such information as they have acquired in the elementary school.

In Württemberg such continuation schools were started as long ago as 1857, under the name of " Winter-evening Schools ". In 1859 there were

already 180 rural continuation schools, founded by the communes with the assistance of the agricultural societies. In an appendix to the laws relating to the elementary schools, dated November 6, 1858, the attendance at one of the winter-evening schools established voluntarily by the communes was made obligatory for every boy on leaving the elementary school. A Ministerial Decree of February 1, 1866, assured to the communes a State grant to meet half the expenses incurred in founding such schools, and further required the attendance at these schools of all youths between 14 and 18 years of age who had completed the ordinary course of instruction. The Central Office for Agriculture superintends the agricultural portion of the curriculum. In 1867 there were 600 winter-evening schools in Württemberg.

In Rhenish Prussia, agricultural continuation instruction was first given in 1859. There, its introduction and promotion were due to the exertions of the Central Agricultural Union for Rhenish Prussia, which brought before the Government the importance of such instruction and the necessary measures for imparting it. On April 30, 1867, a Government decree was issued with the view of preparing teachers for this work; it required that more attention should be devoted to natural science in the Teachers' College of the Province of Rhenish Prussia and that agriculture should be included in the curriculum.

In the Grand Duchy of Hesse, there were at this date already four farm-schools and agricultural winter schools, while from 1831 to 1839 a winter school had existed in Darmstadt. Much is hoped in the future, when there is a sufficient teaching staff, from the effect upon the farmers of peripatetic agricultural instructors.

In Bavaria, a Ministerial Decree of January 25, 1867, introduced Agricultural Continuation Schools; the establishment and superintendence of the winter-evening schools was entrusted to the Agricultural District Committees ("Kreisausschüsse").

In Baden, Freiherr von Babo had succeeded by 1880 in getting agricultural instruction included in the curriculum of 30 village schools. In 1867 there were, however, already 10 agricultural winter schools. Afterwards, in Baden also, peripatetic instruction was considered of chief importance.

In Austria, in the years 1848, 1869 and 1872 several general Ministerial Decrees also dealt with the promotion of agricultural continuation instruction, in that they allowed, or advised, the teachers to impart it. It was, however, not until September 3, 1875, that a decree was issued containing measures for the establishment and maintenance of agricultural continuation schools. The Imperial Education Law ("Reichsvolksschulgesetz") of May 2, 1882, left it to the district councils ("Landgesetzgebung") to make the necessary arrangements regarding these schools and courses of instruction. The Ministerial Decree of September 2, 1872, had, it is true, made agriculture a compulsory subject in the Teachers' Colleges, but this provision remains in abeyance even at the present time, for the demands made on the time of the students at these Colleges are so manifold that there is no time to spare for instruction in agriculture. In order to remedy this unsatisfactory state of affairs, the writer suggests that during the

summer a five-months' course should be held in the agricultural winter schools in order to qualify young elementary-school teachers to conduct country continuation schools.

772 - **Teaching Manual Work in the Country.** — PABST in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Part 18, pp. 263-266. Berlin, May 3, 1913.

The writer draws attention to the necessity and the opportunity for introducing into the curriculum of rural elementary and continuation schools a course of manual work adapted to the requirements of the different districts. He gives the general outlines of a scheme whereby the present training of teachers could be modified with a view to their being competent to impart such instruction.

773 - **Technical Instruction in Ploughing.** — MURRAY, A. in *The Journal of the Board of Agriculture*, Vol 20, No. 2., pp. 116-120. London, May 1913.

The writer lays special stress on the importance of practical technical instruction in ploughing, and gives a short description of a course of instruction on this subject (usually lasting 2 days) which was organized some years ago by the Hants County Council, with the assistance of the Hants Agricultural Association. Persons taking the course were instructed in the construction of the various types of ploughs, in their use on different soils and for different purposes, as well as in the actual operation of ploughing. At the conclusion, there was a ploughing demonstration and prizes were distributed.

774 - **Second Practical Course of Wine Analysis by the Physico-Chemical Volumetric Method** (1).

The second practical course of wine analysis by the physico-chemical volumetric method will be given by Messrs. Paul Dutoit and Marcel Duboux, Professors of Physical Chemistry at the University of Lausanne, its object is to acquaint analytical chemists in as short a time as possible with the new methods of analysis by means of electric conductivity which are described in the *Traité d'Analyse des Vins par Volumétrie physico-chimique* (Lausanne, Rouge) (2).

It consists of: 1. Some theoretical lessons relating to the general principles of the method and their application. 2. A considerable amount of practical work, consisting chiefly of analyses, for all those who attend the course. (Each person will be provided for this purpose with the necessary materials for experiment and with an apparatus for determining electric conductivity).

The practical work is so arranged that the determinations which are always required (ash, sulphates, chlorides, tartaric acid, acidity) are made first. The estimation of other constituents of wine (phosphates, potash, lime, magnesia, malic acid, succinic acid, etc.), which the chemist rarely carries out owing to the lack of rapid and accurate methods, are demonstrated

(1) For the programme of the first course, held in 1912, see No. 1133, B. Aug. 1912.

(2) See also P. DUTOIT and M. DUBOUX, *The Analysis of Wines by a Physico-Chemical Volumetric Method*, pp. 2562-2569, B. December 1912. (Ed).

later. Finally, a few examples in the determination of the total alkalinity and of acidity of wines will show the chemists that the conductivity method enables certain important elements to be estimated which are not detected in ordinary analysis.

The course and practical work will take place in the Laboratory for Physical Chemistry at the University of Lausanne from July 21 to 29, 1913. Persons intending to attend the course can send in their names up to July 10. Address Prof. Paul Dutoit (Solitude 19, Lausanne). The entrance fee is 50 francs and includes admission to the course and to the practical work, as well as the use of the apparatus and necessary materials for analysis.

# 775 - Agricultural Shows.

## *Argentina.*

1913. October 12-14. Olavaria (Buenos Aires) Cattle Show organized by the Sociedad Rural Argentina.

## *Australia: New South Wales.*

1914. February 17-19. Show of the Guyra Pastoral, Agricultural and Horticultural Society. P. N. Stevenson, Secretary.

February 25-27. Show of the Inverell Pastoral and Agricultural Association. J. Mc Ilveen, Secretary

March 10-12. Show of the Central New England Pastoral and Agricultural Association (Glebe Innes). George A. Priest, Secretary.

March 17-20. Show of the Armidale and New England Horticultural Association, A. Mc Arthur, Secretary.

April 29-May 1. Show of the Northern Agricultural Association (Singleton). E. J. Dann, Secretary.

## *Belgium.*

1913. Ghent. National Show of the Adulteration of Food at the Universal and International Exhibition at Ghent.

August-September. Malines. Show of Intensive Agriculture organised by the town with the cooperation of the agricultural "comices" of the arrondissements.

Nov. 8-10. Brussels. Show of the Brabant Club. For information apply to M. Picard at Nivelles, or to M. W. Collier, 97 Rue des Cailloux, Jette-Saint-Pierre.

November 8-10. Borgerhout, 13 Rue Saint-Joseph. National Poultry Show organized by the Neerhof Society of Borgerhout. Secretary, M. Ing. Dierckx, 221 Chaussée de Turnhout, Borgerhout, Antwerp.

November 15-17. Charleroi. Show organized by the Rabbit Club of the Bassin de Charleroi. Secretary, M. A. Hoe, Place du Sud, Charleroi.

December 20-22. Antwerp. Eleventh International Poultry Show. For information apply, 28 Rue Corfs, Antwerp.

## *Brazil.*

1913. September. Rio de Janeiro. National Rubber Exhibition.

## *France.*

1913. August 2-4. Amboise (Indre-et-Loire). Horticultural Show.

August 14-17. Maisons-Laffitte (Seine et Oise). General Horticultural Show organized by the Horticultural Society of the town. Apply to the Vice-president of the Society, M. Jacquot, 33 Avenue Longueil, Maisons-Laffitte.

August 20-24. Clermont-Ferrand (Puy-de-Dôme). Show of Agricultural Machines and Implements organized by the Agricultural Comice of the arrondissement, on the occasion of the Congress of the Federation of Mutual Assistance and Agricultural Cooperation.

August 20-25. Clermont-Ferrand (Puy-de-Dôme). Horticultural Show.

September 6-7. Privas. (Ardèche). Farm competition (prizes for crops) and Public Exhibition organized by the Ardèche Society for the Encouragement of Agriculture. Apply to M. F. Besson, Secretary of the Society, Privas.

September 6-8. Tarare (Rhône). General Horticultural Exhibition organized by the Horticultural and Viticultural Society of Tarare. Apply to the President of the Society, 70 Rue Savoie, Tarare.

September 13. Pithiviers (Loiret). Show of beet-lifting machines organized by the Agricultural Society of the Pithiviers arrondissement. Apply to M. L. Lesage, Fresne, par Marsainvilliers (Loiret), Secretary of the Society.

September 13-15. Salies de Béarn (Basses Pyrénées). General Exhibition of all the Products of Horticulture, Viticulture and of the industries connected therewith, organized by the "Syndicat d'initiative" of Salies-de-Béarn, with the co-operation of the Horticultural and Viticultural Society of the Basses-Pyrénées.

September 13-21. Arras (Pas de Calais). Second Motocultural Show and Show of Agricultural Motors and "Monobatteuses" organized by the French Motocultural Society. Apply to the General Secretariat of this Society, 58 Boulevard Voltaire, Paris.

September 27. Boistrancourt sugar-factory on M. de Guillebon's property. Exhibition of beet-lifting machines, organized by the Agricultural Comice of Iwuy (Nord).

September 28-29. Montmorency (Seine-et-Oise). Horticultural, Viticultural and Fruit Show organized by the Circle of Practical Arboriculture of Seine-et-Oise. Apply to the Secretary-General, M. A. Vigneau, 22 Rue de Pontoise, Montmorency.

October 9-12. Montpellier. Great Exhibition of the Products of Horticulture and of the Arts and Industries connected therewith, organized by the Federation of the "Sociétés Horticoles du littoral" with the cooperation of the Hérault Society of Horticulture and Natural Science. Apply, the Secretary-General, M. Vachet, 6 Boulevard de l'Observatoire, Montpellier.

November 6-9. Brest (Finistère). Horticultural Exhibition.

1916. Marseilles. Colonial Exhibition.

### *Germany.*

1914. April 3-5. Cologne. Municipal Market and Abattoir. A Show of Animals for the Butcher and of Fat Animals, annexed to the Exhibition of Agricultural Machines, Implements and Agricultural Products, of Stock-Breeding and the Meat Industry and to a Show of Fat Poultry (killed). Apply to the "Direktion des Schlacht und Viehhofes".

### *Hungary.*

1913. September 5-8. Kolozsvár. Seventeenth Show and Market of Stud Animals and Nineteenth Exhibition and Market of Agricultural Machines and Products organized by the Association of the Agriculturists of Transylvania with the support of the Minister of Agriculture for Hungary.

October 9-20. Budapest. Horticultural and Viticultural Show. Apply to the National Horticultural Society of Hungary, (Budapest IV, Molnár, No. 25).

### *Italy.*

1913. September 20-21. Cremona. Show of Heavy Belgian Horses and Light Draught Horses of Hackney origin. Last date of entries, August 20. Apply, 8 Via Lungacqua, Cremona.

September 23-24. Cremona. Show of Milch Cows of the Brown Breed confined to Breeders of the Province of Cremona. Lungacqua 8, Cremona.

### *United Kingdom.*

1913. November 1-7. London. Royal Horticultural Hall. Thirty-fifth Annual Exhibition and Market of the Brewing Industry. Apply to the Managing Director of the Exhibition, 46 Cannon Street, London, E. C.

1914. May-October. Bristol. International Exhibition. Apply to the Bristol International Exhibition Limited, Central Chambers, St Augustine's Parade, Bristol, or to J. Bellham, Esq., 274-277 Bank Chambers, High Holborn, London, W. C.

1914. May-October. Manchester. International Exhibition. The Cotton Industry and the Products of the British Colonies will be largely represented: a special section will be devoted to machines.

*United States.*

1915. Day of Opening February 20. San Francisco. Show of New Varieties of Roses. \$ 1,000 given in prizes.

776 - Congresses.

*Belgium.*

1913. August 18-20. Ostend. Sixth International Fisheries Congress. Address to "Secrétaire général du VI<sup>e</sup> Congrès International de la Pêche", Kursaal, Ostend, Belgium.

*France.*

1913. August 22-31. Soissons (Aisne). Second International Congress of Motor Culture, of Agricultural Motors and of Improved Cultural Methods, organized by the French Society of Motor-Culture.

This Congress, which will include an agricultural section and a machine section, will be combined with an international motor-culture competition and an exhibition of motors, machines and implements. For all information, apply to the Secretary General of the Society, 58 Boulevard Voltaire, Paris.

October 1-3. Lyons. First French National Cold-Storage Congress. A cold-storage exhibition will be held in connection with the Congress.

*Germany.*

1913. August 25-28. Trier. General Assembly of the German Forestry Association ("Deutscher Forstverein").

*Italy.*

1913. September 21, Cremona. Zootechnical Congress, Apply, Via Lungacqua 8, Cremona.

*Switzerland.*

1914. Berne. Fourth Congress of the International Professional Horticultural Union.

## CROPS AND CULTIVATION.

777 - Studies on Lateritization. — 1. BERNARDINI, L. and MAZZONE, G. La laterizzazione nei terreni dell'Italia Meridionale. — *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 146-156. Modena, 1913. — 2. GORTANI, M. Terra rossa, bauxite, laterite. — *Giornale di Geologia Pratica*, Year XI, Part I, pp. 21-39. Parma and Turin, 1913.

1. Following on the lines laid down by Ulpiani (1), the writers have applied van Bemmelen's methods of research to samples of soil from some provinces of Southern Italy. It appears that they have found that in that part of the country lateritic soils are widely spread and that the weathering of aluminous rocks leads to the prevailing formation of laterite instead of clay. Nevertheless they point out, with Ulpiani, that no certain conclusion can yet be drawn as to the intensity and diffusion of the process of the formation of laterite in the soil of Southern Italy, on account of the fact that the methods proposed by van Bemmelen for the diagnosis of lateritic soil have still to be perfected, and also because the number of soils hitherto examined is too small to allow of precise conclusions being reached. At the Royal

SOIL PHYSICS,  
CHEMISTRY  
AND  
MICROBIOLOGY

Chemical Agricultural Station of Portici investigations in both directions are being carried out.

2. The writer observes that recently considerable progress has been made in the knowledge of the petrography, chemistry and history of three types of aluminous and ferruginous rocks: red earth, bauxite and laterite. Considering the importance of these rocks, especially from the agro-geological point of view, and the confusion of words and ideas concerning them, he examines critically the results hitherto obtained and arrives at the following conclusions:

I. Under the name "red earth", the insoluble residue of limestones and dolomites is designated. It is essentially constituted by aluminium hydroxide, almost always with iron hydroxides and other minerals, sometimes authigene, at other times to a greater or less extent allothigene.

II. From the geological, lithological and practical points of view it appears advisable to reserve the name of "bauxite" for those rocks consisting essentially of hydroxides of alumina (and iron) which are included in calcareous formations and which therefore reveal themselves as ancient "red earths".

III. The name "laterite" is to be extended to all rocks essentially formed by hydroxides of alumina (and of iron, titanium and manganese) derived from the alteration of silicate rocks.

In the formation of laterite, doubtless many causes have concurred; some of them taken singly explain the origin of individual deposits, but the causes and general laws which govern this formation are still unsolved problems. In view of this uncertainty, the opportunity of distinguishing the various kinds of laterite as to their age, composition, etc., seems to the writer to be very doubtful, and equally doubtful appear to him the general deductions that some writers infer from local observations or from too special and incomplete researches. In this particular case he doubts the correctness of the above-mentioned conclusions formulated by Ulpiani and his school, because the samples of soil dealt with, coming as they do from calcareous districts, do not appear to be "laterites" but "red earths". This error probably arises from the purely chemical method that has been followed, namely that of taking as a basis the molecular ratio of silica and alumina soluble in hydrochloric acid.

IV. The process of "ferrettizzazione" (1) is also probably connected with the preceding forms of alteration. The writer considers that a modern and accurate investigation of this phenomenon would be very desirable, both as regards its precise nature and the probable profound difference between the "ferretti" derived respectively from silicious and calcareous rocks.

(1) Formation of "ferretti", ferruginous clays of the sub-alpine alluvial plateaus, (Ed.).

778 - On the Alkaline Reaction which may be caused by Acids and Acid Salts in the Soil. — MASONI, G (Laboratory of Agricultural Chemistry of the Royal University of Pisa) in *Le Stanoni Sperimentali Agrarie Italiane*, Vol XLVI, Part 4, pp. 241-263, Modena, 1913.

It is well known that the reaction of the soil exerts a great influence on its fertility (1). The writer has conducted some experiments either by treating soils containing more or less lime with  $\frac{N}{50}$  or  $\frac{N}{100}$  solutions of acids and acid salts in flasks, and then examining the liquids, or by examining the liquids obtained by percolation from the soils treated in funnels or in tubes open at both ends; and he has observed that mineral and organic acids and their acid salts can cause an alkaline reaction in soils.

The explanation of the fact appears to be in the formation of calcium bicarbonate, not excluding however the possibility of other more general causes, such as the action of the acids on basic salts, which may always be present in soils (lime, magnesia, alumina, etc.). Phosphoric acid and the bi-acid calcium and potassium phosphates have shown a special behaviour. The persistence of the acid reaction with phosphoric acid seems to be explained by the formation of mono-calcium phosphate, which, on account of its very weak acid affinity, may remain unchanged, notwithstanding the excess of lime. The alkaline reaction, which nevertheless may be obtained with pure calcium carbonate or with soil well pressed into long tubes, appears to depend on the special conditions which facilitate the action of carbon dioxide, and consequently the formation of bicarbonate. From the above it follows that it is still more difficult to obtain the alkaline reaction with mono-calcium phosphate. The alkaline reaction which may be had with mono-potassium phosphate is explained by the formation of alkaline carbonate at the expense of the lime.

In connection with these investigations, it is mentioned, from a practical point of view, that the use of mineral acids (sulphuric acid for instance) against weeds may produce an alkaline reaction in calcareous soils. Ferrous sulphate, which also possesses an acid reaction, on the contrary does not cause an alkaline reaction on account of the formation of insoluble compounds. As may be expected for the reasons given above, the use of superphosphates leads to the continuance of the acid reaction.

Of especial interest, lastly, is the question of root secretions. The carbonic acid produced by the respiration of roots must produce in calcareous soils a medium having an alkaline reaction; besides which the acids, which according to various writers are admitted to be secreted by roots, should also contribute to the production of an alkaline reaction in calcareous soils. Experiments made in this connection appear in fact to have demonstrated the production of a distinct alkaline reaction caused by roots in soils containing lime. These experiments will be resumed, especially in connection with the study of the causes of chlorosis.

(1) See No. 42, B. Jan. 1912.

(Ed.).

779 - **Some Bacteriological Studies of Old Soils.** — SHARP, L. T. (University of Nevada) in *The Plant World*, Vol. 16, No. 4, pp. 101-115. Baltimore, Md., April 1913.

The writer had the opportunity of studying soil samples from the collection of Dr. E. W. Hilgard which had been tightly stoppered for from 25 to 33 years; he was thus enabled to investigate the bacterial flora still present in them and the resistance of organisms to drying of the soil, which is a problem of much practical and scientific interest. Of the 9 samples examined, two were taken from alkali soil, two from adobe ridge (surface soil and subsoil respectively), one from adobe 10 to 20 inches in depth, one from black adobe 6 to 12 inches in depth, one from loam, one from foothillsandy soil 1 to 12 inches in depth, and one from rich loam.

The summary of the investigations was as follows :

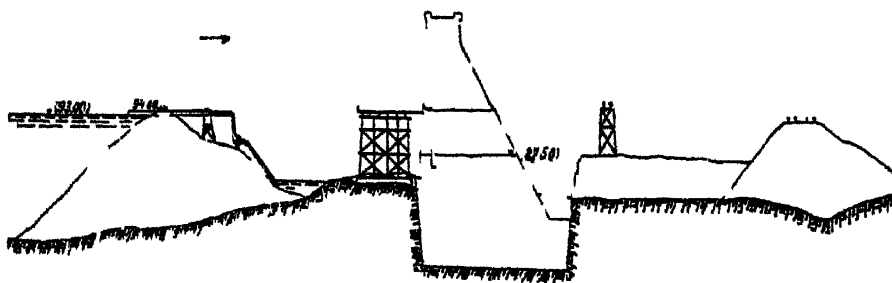
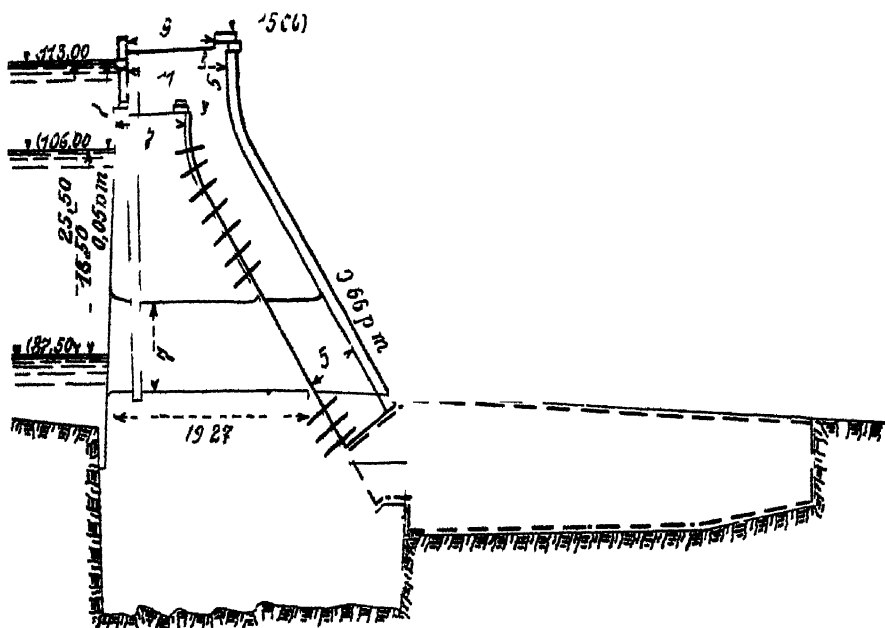
1. Soils free from excessive alkali salts retained from 75 000 to 570 000 organisms per gram after thirty years drying under room conditions. Alkali soils contained under similar conditions 5000 to 60 000 organisms per gram.
2. The ammonification flora is most resistant, being especially strong in the alkali soils.
3. Nitrification occurs feebly in two soils and is permanently destroyed in the other seven soils.
4. Though *Azotobacter* forms are entirely absent in all but the foothill sandy soil, the nitrogen fixation power of the soils is well maintained by other organisms.
5. There is no relation between numbers and physiological efficiency.
6. The persistency of these organisms under dry conditions and their renewed activity in the presence of sufficient moisture is agriculturally important.
7. The soil exhibits a protective function towards lower forms under adverse conditions.

780 - **The Value of Soil Analyses to the Farmer.** — HALL, A. D. (The Development Commission). — *The Journal of the Royal Agricultural Society of England*, Vol. LXXXIII, pp. 1-9. London, 1912.

After having dealt with the subject at length, the writer thus summarises the present position of soil analysis :

1. Mechanical analysis enables us to classify soils and assign an unknown example to its type.
2. From the type, combined with knowledge of the situation and climate, we may predict its suitability or otherwise for particular crops.
3. Chemical analysis will tell us whether a soil is getting acid or needs liming to make it work properly and utilize the manure supplied to it.
4. From chemical analysis we can settle what class of manures ought to be used — whether sulphate of ammonia or nitrate of soda, superphosphate or basic slag.
5. Chemical analysis will often reveal particular deficiencies and the specific need for phosphates or potash, but to do this with any certainty, the composition and behaviour of soils of that type should be known from a previous soil survey.





Fig

The writer draws attention to the fact that abnormal soils have frequently to be dealt with, and in order to attack the problems presented by such soils it is necessary in the first place to accumulate information and data as to the nature and composition of known soils, and in the second place to increase our knowledge and perfect our methods of analysis.

781 - **Irrigation in Egypt and the Nile Dams.** — LUIGGI, L. in *Annali della Società degli Ingegneri e degli Architetti Italiani*, Year 18, No. 10, pp. 263-279. Rome, May 12, 1913.

PERMANENT  
IMPROVEMENTS,  
DRAINAGE AND  
IRRIGATION

In ancient times Egypt was the best irrigated country in the world. The waters of the Nile were used for fertilizing and irrigating the country. But through imperfect upkeep the works were allowed to fall into decay and lost their importance. Only during the last decades new works have been undertaken which restore to the Nile its former importance. New dams have been built and the network of canals has been extended. The most important barrage is that of Assouan. Fig. 1 shows its cross-section and gives its chief dimensions in metres (1 metre = 39.37 inches). Fig. 2. shows the cross section of some of those preliminary works that had to be made to drain certain localities.

The total cost of this work amounted to about £ 10 500 000, but the advantages produced by it exceeded all expectations. The yearly rent of the land, which averaged before 1894 about £ 3 12s 6d per acre, rose to £ 9 13s 6d, and principally because, whilst formerly only one crop a year was possible, now two and sometimes three are attainable and cotton growing has become common. Lucerne gives as many as twelve cuts per year.

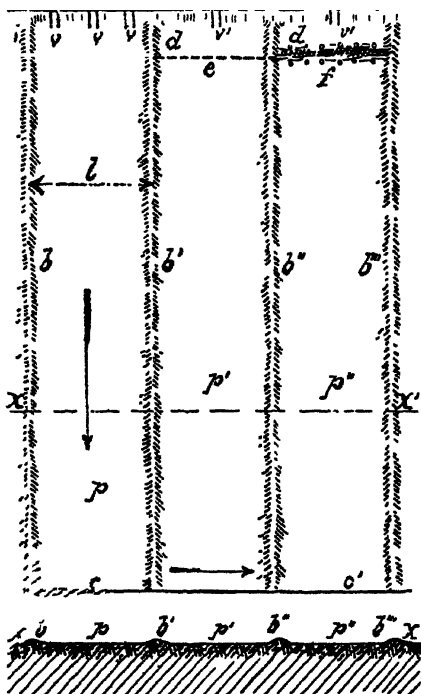
The rental value of the soil has risen from £ 15 500 000 per year in 1895 to £ 34 500 000 in 1910; that is, the yearly increase amounts to £ 19 000 000, or almost twice as much as the cost of the whole work.

782 - **Irrigation on Narrow Strips.** — RINGELMANN, M. in *Journal d'Agriculture pratique*, Year 77, Vol. 1, No. 19, pp. 599-601. Paris, May 8, 1913.

When irrigation by flooding has to be carried out on fields having a very slight fall ( $\frac{1}{2}$  or 1 per 1000) and a considerable length, it becomes necessary to diminish the breadth of the field in order to prevent the formation, in some points, of currents which would erode the soil.

This erosion of the soil can never be completely avoided, especially where considerable quantities of water are used, but it can be much reduced when the breadth of the strip to be watered is diminished, and this can be done, as is shown in the accompanying figure, by dividing the field into long narrow strips (p, p', p'') limited on each side by small embankments (b, b', b''). The breadth of these strips is from 16 to 33 feet. Their length varies between 100 and 200 feet, in some instances 500 and even 2600 feet, but this method is not advisable, for, as is well known, with the increasing length of the strip the oxygen content of the water diminishes. The height of the little embankments between the strips varies from 2 to 4 inches and their breadth between 12 and 24 inches. In the annexed figure the irrigating channel is shown in (a) and the out-flow drain in (c, c'). In order to prevent erosion taking place at the

upper end of the field either several openings (v) are made at distances of 10 feet from each other in the irrigating channel, or only one opening (v')



leading into a small reservoir (d) whence it flows through a barrage (e f) onto the field.

In the second part of the paper the writer describes a case in which this system has given excellent results.

MANURES  
AND  
MANURING

783 - **Thirteen Years of Experiments with Farmyard Manure at the Askov Experiment Farm, 1898-1910.** — 49th Circular of the State Service for Agricultural Experimentation, Copenhagen, March 28, 1913. Communicated by the Danish Office of the International Institute of Agriculture.

Experiments conducted with the following soils and rotations :

	Rye.
	Hoed crops.
	Oats.
Light loamy soil . . . . . {	Seeds.
	Seeds, or mixture of $\frac{3}{5}$ barley and oats, $\frac{2}{5}$ peas and vetches.

High, dry sandy soil . . .	{	Rye.
		Hoed crops
		Oats.
		Seeds, or above mixture.

During the last four years the seed-ley was no longer kept down a second year, so that the rotation was the same for both soils.

*Different amounts of dung given at the same time.* — The yearly quantities applied were respectively, 5000, 10 000 and 15 000 Danish pounds per tondeland (1), divided as follows: on the loam soil, during the first years  $\frac{2}{3}$  to the rye,  $\frac{2}{3}$  to the hoed crops and  $\frac{1}{3}$  to the oats; during the last years  $\frac{3}{4}$  were given to the hoed crops. On the sandy soil one half was given to the hoed crops and the other half to the oats; besides which control plots were made, no manure being given to them.

*Average results in fodder units per tondeland.*

	Loam soil lbs.	Sandy soil lbs.
Unmanured plots . . . . .	2663	1414
Plots with 5000 lbs dung per year . .	3181	—
Plots with 10 000 lbs. " " " .	3518	2583
Plots with 15 000 lbs " " " .	3807	2998

Referring the excess of crop to the quantity of dung used, the following comparative data are obtained.

*Excess of crop in fodder units referred to every 1000 lbs.  
of dung per tondeland.*

	Loam soil lbs	Sandy soil lbs
Plots with 5000 lbs. per acre .	104 (156)	—
" " 10,000 " " " .	86 (117)	117
" " 15 000 " " " .	76 ( 98)	106

The data in brackets represent the results of a series of experiments in which the crop on the control plots was smaller.

The principal result of these experiments is that the useful effect of stable manure diminishes considerably with the increase of the quantities employed. In loam soil this decrease was from 12 to 16 per cent. of the excess of crop in passing from a medium to a heavy application of dung; in sandy soil the decrease was 10 per cent.

*Different times of application of dung, with or without liquid manure.*

— Using three different amounts of dung on the loam soil and only one on the sandy soil, the dung was applied to some plots of hoed crops and oats in the spring (April or early May) and to the other plots in the preceding autumn (November). For rye the manure was given immediately be-

(1) The Danish pound = 1.1023 lb.; the tondeland = 1.36 acre.

(Ed.).

fore sowing, usually at the beginning of September. The stable manure contained about the same amount of plant food in autumn as it did in spring.

The liquid manure was given in spring to half of the plots on loam soil. In the first years it was given both to the hoed crops and to the seed-ley; to the former in doses of 20 000 lbs. per tonde-lard and to the latter of 10 000 lbs. In recent years the amounts were proportional to the amount of dung applied and they were given only to the hoed crops.

*Average crops in fodder units per tonde-lard.*

	Loam soil	Sandy soil
Plots manured in autumn without liquid manure	3 453	2 281
Do. in spring without liquid manure . . . .	3 551	2 589
Do. in autumn with liquid manure . . . . .	3 767	—
Do. in spring with liquid manure . . . . .	3 809	—

On loam soil the use of manure in autumn as compared with its use in spring yielded 3 per cent. less of the total crop when liquid manure was not given in the following spring, but when this was given to hoed crops and to seed-leys forage plants the loss was reduced to 1 per cent. Thus the liquid manure not only contributed to increase the crops, but also to diminish the loss due to the application in autumn; in fact these losses, with hoed crops, were 4 and 8 per cent. accordingly as the liquid manure had been applied or not and with oats 2 and 5 respectively. In sandy soil the average loss due to the application of manure in autumn was 12 per cent. of the total crop, distributed among the various crops as follows: 3 per cent. for rye, 16 per cent. for beets, 7 per cent. for potatoes, 19 per cent. for oats and 6 per cent. for seeds.

The liquid manure applied to clayey soil manured in autumn produced an increase in the crop of 15 fodder units per lb. of nitrogen, but only of 13 when given with spring manuring. The average content of the liquid manure was 0.338 per cent. of nitrogen and 0.635 per cent. of potash.

784 — **Action of Fermenting Manure on Reinforcing Phosphates.** — TOR-  
TINGHAM, W. E. and HOFFMAN, C. (Agricultural Chemistry and Bacteriology Labo-  
ratories, Wisconsin Experiment Station, Madison). in *The Journal of Industrial and  
Engineering Chemistry*, Vol. 5, No. 3, pp. 199-209 + figs. 3. Easton, Pa., March 1913.

Considerable evidence has been accumulated which indicates advantage from the use of finely ground rock-phosphate directly as a fertiliser, especially when it is applied in conjunction with a liberal supply of organic matter. The work described in this paper includes studies of the action of fermenting manure on rock-phosphate or floats (rock-débris). The fresh manure free from litter (a mixture of  $\frac{1}{3}$  horse manure and  $\frac{2}{3}$  cow manure unless specified otherwise) was thoroughly hand-mixed with floats in the proportion of 1 lb. of floats to 50 lbs. of manure. The samples were fermented in covered iron pails; and water was added occasionally in the earlier experiments to maintain a fairly even moisture content of the check and reinforced manures.

Fermentation over periods of 4 to 6 months caused a decrease of water-soluble phosphorus in manures and mixtures of manures with rock-phosphate. The losses were greatest in the mixtures, where they amounted to more than one-half the soluble phosphorus originally present. Ammonium citrate solution and fifth-normal nitric acid did not recover this depressed phosphorus in all cases and hence other changes than simple reversion to insoluble phosphates apparently occurred.

Ammonium carbonate solution of the strength existing in the moisture of fermenting manure was no more efficient than water as a solvent for phosphorus in fermented manures and manure-phosphate mixtures. A saturated solution of carbon dioxide was not superior to water as a solvent for phosphorus in manures and mixtures which had fermented about two and one half months, and in which bacteria were active, but was superior when fermentation had covered 10 months and the bacteria had become practically inert. It was five times as efficient as water or the ammonium carbonate solution in solvent power for phosphorus of rock-phosphate. The addition of either chloroform or formaldehyde, which practically inhibited bacterial action, greatly reduced the losses of water-soluble phosphorus in mixtures of manure and rock-phosphate.

Dry bacterial cells of manure organisms grown on agar media contained 4 to 8 per cent. phosphoric acid. The growth of manure organisms upon media supplied with the soluble phosphorus of fresh manure rock-phosphate mixtures depressed the water-soluble phosphorus of the media by amounts which were comparable to the losses of water-soluble phosphorus observed in fermenting manures. About one-half the phosphorus of fresh intact bacterial cells was soluble in water. This phosphorus was apparently derived chiefly from inorganic phosphates absorbed from the media. The remaining phosphorus of the cells was probably present in nuclein compounds.

Acid-phosphate incorporated with the fermenting manure underwent essentially the same changes of solubility as rock-phosphate. In the presence of chloroform, however, the acid-phosphate decreased markedly in solubility, while with rock-phosphate no decrease occurred. Application of monocalcium phosphate to barley in pot experiments gave greater immediate returns when the phosphate was applied with previously fermented manure than when it was applied in a fermented mixture of manure and phosphate. The immediate returns from tricalcium phosphate were the same whether it was applied with previously fermented manure or in a fermented mixture. A second crop of barley from the original application of reinforced manures gave a superior yield from the fermented mixture for both phosphates.

In conclusion this work requires confirmation under field conditions before it can be applied to direct agricultural practice. However, so far as pot experiments indicate conditions in field experience, the final results from mixing rock-phosphate with fermenting manure appear to be advantageous. In the case of acid-phosphate it appears inadvisable to mix the material with fermenting manure. It is probably better practice to add it to the manure at the time of application to the field.

785 - The General State of the Nitrate Trade in 1912 and in the Beginning of 1913. BROWNE, A. G. (gerente interiao) in *Asociacion Salitrera de Propaganda, Circular Trimestral*, No. 59, pp. I - LIII. Iquique, April 15, 1913

The following data, which complete those published by the International Institute of Agriculture in *Production et consommation des engrais chimiques dans le monde*, (1913), are taken from the last Report of the Directors of the "Asociación Salitrera de Propaganda" to its members:

	In 1912: tons	In 1911: tons	Difference: tons
Production according to the data communicated by the establishments . . . . .	2 545 938	2 482 112	+ 63 826
Exportation . . . . .	2 454 602	2 411 707	+ 42 895
Consumption . . . . .	2 490 502	2 363 299	+ 127 203

The figures corresponding to the first six months of the "salitrero" year, July to December, were as follows:

	July 1 to Dec. 31 1912: tons	July 1 to Dec. 31 1911: tons	Difference tons
Production . . . . .	1 329 610	1 255 281	+ 74 329
Exportation . . . . .	1 429 821	1 432 404	- 2 583 in 1912-13
Consumption . . . . .	749 906	659 114	+ 90 792 in 1912-13

The stocks visible on December 31 were:

In 1912: tons	In 1911: tons	Difference: tons
1 594 357	1 667 657	6 604 304

As a complement to the above, the following are the figures dealing with the consumption in Europe during the months of February and March 1913, compared with those of the preceding year.

	In 1912: tons	1913: tons	Difference: tons
February . . . . .	307 430	233 160	74 270
March . . . . .	436 240	355 470	80 770
Smaller amount of consumption . . .			155 040

According to the market reports of some of the principal firms this decrease of consumption is due to the insufficient quantity of nitrate of soda in the ports of delivery compared with the demand, which in its turn is caused by the slackening of transport by sea owing to the English colliers' strike of 1912

786 - **Cyanamide, Dicyandiamide and Nitrolime.** — DE RUIJTER DE WILDT, J. C. and BERKHOUT, A. D. (Rijkslandbouwproefstation te Goes) in *Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouw-proefstations*, No. XIII, pp. 61-116 + XXIX Tab. + app. The Hague, 1913.

This is a continuation of previous investigations with special regard to the chemical factors in the phenomena of the transformation of nitrolime. Pure cyanamide and dicyandiamide prepared from nitrolime were used.

In the investigations the cyanamide was determined by weight as a silver salt.

*Stability of cyanamide in the dry state.* — The titration of pure cyanamide kept for two years in a state of dryness diminished from 98.1 per cent. to 94.1 per cent.

*Stability of cyanamide in solution.* — Of two solutions of cyanamide in water, one containing 0.25 and the other 1 per cent, kept for fifteen months, the first may be considered as practically stable, only the titration of the second diminished somewhat, namely from 98.3 to 94.3 per cent. Solutions of about 0.5 per cent. were kept at normal temperatures, at 40° C. and at 60° C. for a month and a half; in the first case the solution kept almost unchanged, at 40° and 60° the transformation was more marked. A solution of 2 per cent. cyanamide concentrated to dryness on sulphuric acid for 9 days still contained 90.4 per cent. of the original quantity of cyanamide; the same solution boiled in an apparatus with refrigerator contained after 40 minutes 91.2 per cent. of the original quantity; lastly, evaporated almost to dryness over a water-bath it was transformed almost entirely into dicyandiamide.

*Action of salts, acids and bases on cyanamide solutions.* — A solution of 0.5 per cent. of cyanamide was treated for three years with  $\frac{N}{50}$  solutions of sodium, ammonium, calcium and potassium chlorides, of sodium and ammonium nitrates, of ammonium sulphate and suspended calcium carbonate; only the calcium salts caused a sensible transformation into dicyandiamide; the presence of chlorides caused a diminution of the nitrogen in the silver salt. On experimenting for 7 months and under equal conditions with the three potassium phosphates it was found that a formation of dicyandiamide took place with bi-potassium phosphate and still more with the neutral salt. Lastly, experimenting for two months with solutions containing 0.5 and 1 per cent. of cyanamide and  $\frac{N}{50}$  solutions of sulphuric, hydrochloric and nitric acids, ammonium, sodium and calcium hydrates, it was found that with the acids the formation of urea took place to the same extent, while the formation of dicyandiamide is more intense with the bases and especially with calcium hydrate; besides, it appears that the degree of concentration has more influence than the quantity of the bases and acids present; thus a very weak acid such as carbonic acid, after a month, had had scarcely any action.

The writers did not find any alteration due to surface tension or to oxide of iron. In this connection the eventual action of enzymes is to be investigated, as they might explain the conflicting opinions held on the toxicity of calcium cyanamide as a fertilizer.

*Dicyandiamide.* — The writers propose determining dicyandiamide by transforming it into guanilurea by the action of acids and then precipitating it as picrate. The solutions of dicyandiamide in themselves are stable; the transformation takes place quantitatively with an excess of acid, but a high degree of acidity is not favourable.

*Behaviour of solutions of nitrolime and of lime-nitrogen.* — The transformation into dicyandiamide was observed, and also that it was more rapid in concentrated solutions. The formation of ammonia was rarely observed in many years.

*Behaviour of nitrolime and of lime-nitrogen (1) in well closed vessels.* Of two commercial samples of nitrolime and of two of lime nitrogen, only two of the latter underwent sensible transformations, probably owing to the moisture they had previously absorbed. This shows the possibility of alterations taking place even in well closed vessels, and the writers conclude after several experiments that the alterations of nitrolime are due only to dampness and not to the action of carbonic acid.

*Mixture with other fertilizers.* — The following results were obtained by keeping in well closed flasks several samples and observing the quantity of ammonia that was absorbed by a titrated solution of sulphuric acid situated in small tubes within the flasks.

*Losses of ammoniacal nitrogen in milligrams.*

	January 31, 1908	April 9 1908	July 31 1908	Dec. 7 1908	June 14 1909	Nov. 4 1909	Total
10 grams nitrolime . . . . .		9.1	61.74	6.58	4.76	5.88	88.06
do + 10 grams water . . . . .		70.28	12.32	12.32	8.54	9.52	112.98
do + 10 " potassium-magnesium sulphate . . . . .		7.98	41.44	11.62	9.66	9.94	80.64
do + 20 grams kainit . . . . .		20.02	35.42	8.4	8.68	10.22	82.74
do + 20 " superphosphate . . . . .		0.14	20.44	27.72	19.46	19.18	86.94
10 grams lime nitrogen . . . . .		14.84	32.34	5.6	5.74	7.0	65.52
do + 10 grams water . . . . .		45.64	9.94	8.12	8.82	10.22	82.74
do + 10 " potassium-magnesium sulphate . . . . .		10.36	30.24	7.84	7.7	9.24	65.38
do + 20 grams kainit . . . . .		18.48	22.82	6.44	6.44	8.82	63.00
do + 20 " superphosphate . . . . .		0.14	33.60	18.48	14.98	10.22	77.42

(1) See INSTITUT INTERNATIONAL D'AGRICULTURE. *Production et consommation des engrais chimiques dans le monde*, 1913. (Ed)

At the end of these experiments all the nitrogen present was transformed into dicyandiamide; noteworthy is the increase of temperature when mixed with superphosphate, without however loss of ammonia taking place. In conclusion nitrolime may be mixed with the above fertilizers without fear of any loss of nitrogen, even if the mixture be made some time before using it. There is only the danger of retrogradation with superphosphates and consequently it is advisable to mix with kainit when nitrolime is to be spread some time before sowing.

*Effects on germination.* — The final results may be given of some experiments begun on July 13 with white mustard in cylinders containing respectively peaty, gravelly, sandy and loamy soils. They were calculated graphically on July 20 by multiplying the number of well-developed plants by the average height. Except for the gravelly soil the highest index was obtained with nitrate of soda; next comes that of the untreated soils and of those treated with guanilurea which is only equalled or exceeded by dicyandiamide on loamy soil; then follow dicyandiamide and old and transformed nitrolime which behave almost alike; the least favourable results were those obtained by cyanamide and nitrolime which present about the same parallelism.

*Pot-culture experiments.* — The principal result of these experiments conducted in 1911 and 1912 with white mustard is that old and altered nitrolime has next to no useful effect, the eventual fertilizing action being balanced by its toxicity.

*Conditions of sale.* — Following on an understanding between the "Verkaufsvereinigung für Stickstoffdünger" of Berlin and one of the writers on behalf of the Dutch Experiment Station it was agreed that for Holland nitrolime was to contain at least 70 per cent of its total nitrogen under the form of cyanamide nitrogen with a margin of 5 per cent. This limit is easily exceeded in the factories and anyhow the effect of dicyandiamide nitrogen cannot be compared to that of cyanamide nitrogen. Attention is also drawn to the disadvantages due to the presence of calcium carbide.

The writers intend to continue their investigations.

787 — **Lime Rich in Silica as Manure.** — IMMENDORF, H. *Die Landwirtschaftlichen Versuchs-Stationen*, Vol. LXXIX-LXXX, pp 891-901. Berlin, 1913

The writer in a series of experiments with several calcareous materials containing from 0.03 to 19.51 per cent. of silica soluble in hydrochloric acid, on six loams containing from 17.90 to 36.18 per cent. of clay and from 53.07 to 75.97 per cent. of sand, did not find any of the inconveniences commonly mentioned by various writers. The conclusion which he draws is that manuring with quicklime containing silicic acid acts on the soil in the same manner as manuring with ordinary quicklime. The formation of cement-like concretions can be completely avoided by carefully spreading the lime on the soil and mixing it in well during favourable weather. Lastly it has been noted that the hydrated silicic acid that is formed has a beneficial action, since it increases the absorbent power of the soil.

788 - **The Relation of Lime to Magnesia in Soils.** — VOELCKER, J. A. (The Woburn Experimental Station of the Royal Agricultural Society of England, Pot-Culture Experiments 1910-11-12) in *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 325-338 + Plates 9-11. London 1912.

Continuation and conclusion of pot-culture experiments begun in 1906 on wheat :

a) in soil containing 0.40 per cent. of lime and 0.20 per cent. of magnesia with the addition of magnesia, and magnesia and lime, in various proportions;

b) in soil containing 0.83 per cent. of lime and 2.29 per cent. of magnesia with the addition of lime in various proportions.

The general conclusions of the writer are :

1. That magnesia may, with advantage to the wheat plant, be added to a soil poor in magnesia, so long as the amount of magnesia in the soil does not exceed that of lime.

2. That as the ratio of lime to magnesia approaches 1:1, a benefit will continue to accrue, but that if magnesia be in excess, a toxic influence will be exercised and the crop be diminished.

3. That soils in which magnesia is in excess of lime will not give fully satisfactory results as regards corn-growing, but will be benefited by the addition of lime.

4. That lime used in excess does not possess the toxic influence which magnesia similarly used has.

5. That magnesia and lime alike are capable of modifying the growth of the wheat plant, altering the nature and extent of the root development and the character of the grain. These modifications are mainly shown in the stronger and greener appearance of the flag, the production of a much developed and very fibrous root growth, and the greater assimilation of nitrogen, resulting in the obtaining of a more glutinous grain.

The writer gives the results of a field experiment.

On a plot 36 sq. feet in extent divided into two equal parts, one of which contained 0.77 per cent. of lime and 0.20 per cent. of magnesia and the other 0.77 per cent. of lime and 0.40 per cent. of magnesia, Squarehead's Master wheat was grown in 1910-11, but as the crop was destroyed it was resown and the following results were obtained :

	Grain lbs.	Straw lbs.	Percentage of nitrogen in grain
With 0.20 per cent. of magnesia .	2	4 $\frac{1}{4}$	1.77
» 0.40 » »	3	6 $\frac{3}{4}$	2.17

The commercial value of the grain obtained from the plot with 0.40 per cent. of magnesia was estimated at 1s 6d per quarter more than the other.

759 - **The Influence of Lithium, Zinc and Lead Salts on Wheat.**—VOELCKER, J. A. (The Woburn Experimental Station of the Royal Agricultural Society of England, Pot-Culture Experiments, 1910-11-12: Hills' Experiments) in *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 314-325 + Plates 1-8. London, 1912.

These investigations are a continuation and conclusion of pot experiments on wheat, the first of which was made in 1898 with lithium salts; in 1909 experiments were begun with salts of zinc, and in 1912 with salts of lead.

The first and principal conclusion drawn from these experiments is that the presence in the soil of quite small quantities of what are termed the « rarer constituents » has a far greater influence on vegetation than has hitherto been supposed.

As for the results special to each substance it was found :

a) Lithium :

1) That in the form of any of its salts it produces a toxic effect if it is present in the soil to the extent of 0.003 per cent. or above.

2) That the toxic effect is greater the more lithium there be present and that the form of nitrate is the most toxic.

3) That when present in the soil in an amount not exceeding 0.002 per cent. lithium possesses a stimulating influence.

4) That among all the salts of lithium, the nitrate would seem to be the most stimulating salt and to produce the best results when not in excess of 0.001 per cent.

5) That the action of the salts of lithium on vegetation is exerted mainly in the early stage of the germination of the seed.

b) Zinc.

1) That its salts when present in the soil in amounts exceeding 0.02 per cent. produce a toxic effect; below this quantity they possess a slightly stimulating influence, more noticeable with the more soluble salts and especially with the nitrate.

2) The toxic and the stimulating influences of zinc are about one tenth those of lithium.

c) Lead.

1) That when it is present to the extent of 0.03 per cent. it does not possess any toxic influence upon vegetation; on the contrary the nitrate, with that amount present, would seem to possess stimulative properties.

2) That further experiments are needed to determine the amounts that can be safely or advantageously used.

The writer lastly considers it necessary that similar researches be now extended to other crops in order to ascertain whether, as upon wheat, minute quantities of certain metallic compounds exercise an action capable of bringing about changes in their development, root formation and even in the nature of the grain produced.

790 - Annual Report for 1912 of the Consulting Chemist. — VOELCKER, J. A. in *The Journal of the Royal Agricultural Society of England*, Vol. I, XXXIII, pp. 276-283. London, 1912

Amongst the questions relating to the control of fertilisers and feeding stuffs, the writer refers to a) the use of sawdust — in its raw or prepared condition — as a constituent of feeding cakes or meals; b) the so-called solubility of basic slag. He considers that sawdust is not a proper material to use for stock, while the question of the solubility of basic slag still remains unsolved. He calculates further that the fertilizing value of hop bine which is lost when the latter is carted off the land instead of being burnt and spread in the form of ashes is 6s 0d per acre.

AGRICULTURAL  
BOTANY.  
CHEMISTRY  
AND  
PHYSIOLOGY  
OF PLANTS

791 - Studies in Nitrogen Nutrition in Plants. — POUGET, I. and CHOTCHAK, D in *Annales de la Science Agronomique*, Year 30, No. 4, pp. 281-302. Paris, April 1913.

The following experiments were carried out with eight different soils, — A to H — each of which was distributed in 6 pots. The pots contained 3.8 kilograms of soil. Two in each series received in addition a sufficient quantity of potassium phosphate, potassium chloride, and calcium nitrate to supply 1 gr. of  $P_2O_5$ , 1 gr. of  $K_2O$ , and 1 gr. of N respectively; three others received the same dressing without the nitrate, and of these two were used for measuring the crop while the other was used for soil sampling; the sixth pot of the series remained uncropped and served as a control for estimating the nitrification going on in the soil. A moisture content of 18 per cent. was adopted in the earlier stage of the experiment, and later increased to 21 per cent. as the weather got hotter; it was maintained by means of a daily watering on a balance. Millet seedlings were planted on February 27th. On April 30th one third of the crop in each pot was harvested and the soil was sampled at the same time. On June 6th the remainder of the crop was harvested, fully mature, and the soil was again sampled.

In every case the plants receiving nitrate produced bigger crops, the increase varying with the different soils, and the duplicates agreed very well together. Taking the crop with nitrate as 100 in each series, the crops without nitrate were as follows :

Soils	April Harvest	June Harvest
A . . . . .	18.9 %	20.6 %
B . . . . .	14.7	14.4
C . . . . .	47.0	19.7
D . . . . .	28.6	17.9
E . . . . .	61.3	37.2
F . . . . .	43.5	63.3
G . . . . .	83.5	80.9
H . . . . .	56.0	43.4

The total nitrogen in the soils does not vary much and could in no way account for the varying effect of the nitrate application.

The process of nitrification in the soil receiving no nitrate was followed by analysing samples drawn from the uncropped pot at the start and

at the time of the two harvests. No considerable accumulation of nitric nitrogen took place in any of the soils, and in G, which was the only one with a fair amount of nitrogen to start with, denitrification actually occurred.

Soil	Total per cent.	Nitrogen in parts per million					
		At the start		April 30		June 6	
		Ammonia	Nitrate	Ammonia	Nitrate	Ammonia	Nitrate
A	13	2.1	5.2	4.5	7.4	8.3	9.1
B	08	0.9	2.5	1.7	2.4	4.8	0.0
C	13	11.5	5.1	8.7	16.2	6.6	20.4
D	12	6.3	3.2	3.4	9.9	3.1	15.0
E	11	9.0	16.8	5.4	15.0	4.0	18.4
F	16	12.0	10.3	3.4	23.5	7.1	23.5
G	11	7.1	37.4	20.2	26.4	4.9	20.8
H	06	8.9	15.1	6.1	12.5	7.6	15.2

The writers attribute this to the daily watering which they consider sufficient to saturate the soil and inhibit nitrification. They were unfortunately unable to analyse the April crop, but assuming that it contained only 3 per cent. of nitrogen, the nitrogen content of the crop was greater in every case than the sum of the nitric and ammoniacal nitrogen in the uncropped pot, from which they concluded that the plants must have been able to absorb the organic nitrogen directly. Their conclusion was confirmed by some field observations at Algiers, where nitrification is frequently temporarily inhibited by heavy spring rains without impeding the activity of the vegetation in any way.

Again, though no correlation could be established between the production of nitrates and the yields obtained, the writers show that there exists a distinct relation between the total soluble nitrogen in each soil and the yields. The total soluble nitrogen was estimated by two methods: in the first 100 gr. of soil were put into a glass tube of about 1 inch diameter, and water was allowed to percolate through it continuously. Every 24 hours the percolate, which amounted to about 60 cc., was collected and analysed. The amount of nitrogen going into solution diminished rapidly for the first few washings, and after that tended to remain constant, indicating a state of equilibrium between the reserve of nitrogen in the soil and the water. In order to investigate further this so-called point of limited concentration, 4 gr. of soil was treated with 1 litre of water to

which a few drops of chloroform had been added to stop bacterial action, and left in contact for a week with an occasional shaking. In this way it was found that the more soluble portions were all removed in the first washing and a state of equilibrium then attained. The writers have shown in previous works that the growth of plants varies with the concentration of the solution in contact with their roots (1).

With regard to the nitrogen supply in an unmanured soil, the plant growth should be at first in proportion with the total "available" nitrogen, *i. e.* that which goes into solution in the first few washings, but when this becomes exhausted the plants would depend on the solubility of the reserve or in other words on the point of limited concentration. In the experiments under consideration the April harvest should therefore be determined by the total available nitrogen, while the June harvest should be influenced rather by the limited concentration point. The results are given below :

	Total available parts per million	Point of limited concentration parts per million
A . . . . .	27.0	0.184
B . . . . .	16.8	0.160
C . . . . .	28.8	0.165
D . . . . .	21.2	0.162
E . . . . .	82.4	0.190
F . . . . .	55.2	0.215
G . . . . .	188.5	0.140
H . . . . .	78.1	0.210

The agreement is good and in the June harvest the only big discrepancy is soil G, which, as mentioned before, had an exceptionally large nitrate content at the start which probably carried it through the growing period.

792 - **The Effect of Artificial Shading on Plant Growth in Louisiana.** - SHANTZ, H. L. in *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 279*, pp. 1-29. Washington, April 1913.

Two long wooden frames, each 24 by 6 feet, were covered by sections of cloth of five different textures which reduced the light intensity within the frames to  $\frac{1}{2}$ ,  $\frac{1}{5}$ ,  $\frac{1}{7}$ ,  $\frac{1}{15}$ ,  $\frac{1}{93}$  of the normal respectively. A sixth section was left uncovered and there were no partitions between the sections. One of the frames (A) was further provided with an electric fan but the variation in temperature and humidity between the two frames proved to be very small. In the two months (April and May) during which the experiment was running, about 70 per cent. of the possible sunshine was recorded.

Maize, potatoes, cotton, radish, mustard, and lettuce were used for the trials, and measurements of the green weight per plant, of the height, and of the diameters of the stems were taken after 30 days, and again after

(1) See No. 235 B. March 1913.

50 days when the experiment was discontinued. The relative green weights per plant were as follows :

Light intensity	$\frac{N}{1}$		$\frac{N}{2}$		$\frac{N}{5}$		$\frac{N}{7}$		$\frac{N}{15}$		$\frac{N}{93}$	
Frame	A	B	A	B	A	B	A	B	A	B	A	B
<i>After 30 days</i>												
Maize . . . . .	100	100	77	94	55	45	30	32	8	5	2	0
Potato . . . . .	100	100	129	57	130	54	168	33	65	26	34	33
Cotton . . . . .	100	100	60	92	68	123	114	49	23	31	12	12
Radish . . . . .	100	100	108	68	79	77	63	48	50	88	0	0
Mustard . . . . .	100	100	70	99	72	123	69	77	16	16	0	0
<i>After 50 days</i>												
Maize . . . . .	100	100	62	94	84	46	47	7	35	0	0	0
Potato . . . . .	100	100	238	146	139	250	282	160	44	27	28	23
Cotton . . . . .	100	100	223	178	91	177	63	31	18	10	0	0
Radish . . . . .	100	100	228	107	157	119	103	55	3	1	0	0
Lettuce . . . . .	100	100	129	107	124	107	106	147	4	9	0	0

During the first period of the experiment growth was on the whole distinctly better in full light, while in the second period only maize shows up as a sun-loving plant. The growth of the other plants increases with shading even when the light intensity is reduced to  $\frac{N}{7}$ .

Similar experiments are now being carried out in Colorado in relation to drought resistance investigations in the semi-arid portions of the United States.

793 - The Resistance Offered by Leaves to Transpirational Water Loss. — LIVINGSTON, B. E. in *The Plant World*, Vol. 16, No. 1, pp. 1-35. Baltimore, Jan. 1913.

The writer elaborated a method of measuring the relative rate of transpiration in plants by means of standardised cobalt chloride paper and a free water surface, the results being stated in terms of the free water surface and called the "index of transpiring power". The method was checked by means of readings from two atmometers and hourly weighings of sealed potted plants, which though not absolutely confirmatory showed considerable agreement, but only two sets of readings are available for comparison on which to base the reliability of the new method. Results of several field

trials are given and indicate that the method should prove of great value in ecological studies, but many more tests will have to be carried out before any reliable generalizations may be attempted.

794 - **Natural Root-Grafting.** — HOWARD, A. in *The Agricultural Journal of India* Vol VIII, Part II, pp 185-189. Calcutta, April 1913.

The harmful effect of trees on the surrounding vegetation is well known to cultivators in India, who recognise that some species do more damage than others, and when the botanical area of the Pusa Experimental Station was laid out, an attempt was made to limit the effect by digging a deep trench each year between certain trees and the adjacent cultivated area. In the case of bamboos and of certain other trees this was quite successful, but in other cases, for instance with pipal (*Ficus religiosa*), banyan (*Ficus benghalensis*) and teak (*Tectona grandis*), negative results were obtained, and when thin patches of the crop were examined in the surrounding land, tree roots were found under the surface up to 217 feet distant from the parent tree. The old trenches were carefully opened up in 1912, and it was found that the severed roots had become connected again. New roots had been formed at the cut extremity, they had grown across the width of the trench, which was 24 to 30 inches, and united with the severed portion of the root by a process of natural grafting followed by a rapid thickening of the connection which attained a thickness of 0.8 to 1.1 inches in 12 months. Moreover a trench 6 feet deep proved insufficient to intercept all roots, apart from their faculty of reuniting, for the roots of the pipal and banyan, which may be 10 to 12 feet deep in the immediate vicinity of the tree, will come to the surface again further off and enter into competition with the crop.

**PLANT  
BREEDING**

795 - **Experiments in Wheat Breeding: Experimental Error in the Nursery and Variation in Nitrogen and Yield.** — MONTGOMERY, E. G. — U.S. Department of Agriculture, Bureau of Plant Industry, Bulletin 269, 61 pp. Washington April, 1913.

The data obtained in the wheat breeding experiments carried out during the 5 years 1905-1910 at the Nebraska Agricultural Experiment Station have been gathered together for the purpose of determining the experimental error in the nursery stage, i. e. the stage at which selections are usually made.

The standard plot adopted at the above station is the « centgener », a plot 5 feet square containing 100 plants 6 inches apart each way; but single rows and larger plots are also used.

In the first part of the bulletin the writer considers the experimental error in relation to the nitrogen content of the grain.

Individual plants in 10 adjacent centgeners and in 10 corresponding lines of 100 plants each, were analysed and the results were grouped in various ways, as were 2-foot sections of a 220-foot drill, also longer rows of 16 feet and small plots 5.5 feet square. The results show that wheat plants under nursery conditions vary considerably in their nitrogen content, the limits being in one case from under 2 % to over 5 %, but the variations are not inherited and must therefore be due to environment; moreover this variation

is not restricted to individual plants, but occurs also, though to a less extent, when centgeners, rows, or small plots are taken as units. The best means of reducing the experimental error proved to be to take a small unit, and make a large number of determinations; for example: single plants 40 determinations; 16-foot rows 5 to 10 determinations and centgeners 8 to 16 determinations; and the method finally adopted as being the most practical for comparing strains on the basis of their nitrogen content consisted of rows 12 to 16 feet long repeated 10 times in different parts of the field.

In the second part of the bulletin the writer treats of the experimental error in relation to yield, which is usually the factor of primary importance in the production of new varieties. As in the previous part of the paper various sized rows and plots were considered and grouped together in different ways. When 16-foot rows were adopted it was found necessary to repeat them 10 to 20 times, and the greater the number of strains the greater the number of repetitions required on account of the increased area occupied by the trial. Small blocks, 5.5 feet square, on the other hand, repeated only 8 to 10 times gave equally accurate results. Increasing the length of the row or the size of the block decreased the variability, but not to the same extent as repeating the unit measurements, and in all trials it was found most important to have control plots interspersed amongst the others to be used for determining the experimental error before the value of differences observed amongst the other varieties could be estimated. Though there were some exceptions, on the whole high yield in the nursery was correlated with high yield in the field, and this was specially true when small blocks were taken as the nursery unit, the reason for this probably being that in that case the methods of sowing were exactly similar; while, in the ordinary centgener the equal spacing of the plants might introduce a fresh factor, and in the case of single rows competition between adjacent rows might introduce another source of error.

- 796 - **Studies of Natural and Artificial Parthenogenesis in the Genus *Nicotiana*.** — WELLINGTON, R. in *The American Naturalist*, Vol. XLVII, No. 557, pp. 279-303. New York, May 1913.

An attempt to produce parthenogenetic seed in the genus *Nicotiana* by means of the stimulus caused by foreign pollen, by mutilations, by fumigation, or by infections. Several hundred trials were made, but no unquestionable case of seed production was obtained.

- 797 - **On the Behaviour of Wheat subjected to the Action of Copper Sulphate Solutions of Different Concentrations.** — LESAGE, P. in *Bulletin de la Société Scientifique et Médicale de l'Ouest*, Vol. 21, No. 3, pp. 129-132. Rennes, 1912.

Wheat grains were steeped in solutions of copper sulphate varying in strength from 31 to 40 per cent. and for times varying from 1 to 195 hours. The vitality of the seeds was not seriously depressed in solutions up to 10 per cent. so long as the grain was not left in the solution more than a few hours. But at the same time it was observed that moulds also developed in solutions up to 10 %, so that the effectiveness of copper sul-

phate dressings for seed grain, which are usually carried out with 1 to 2 per cent. solutions, becomes very questionable. At the same time the writer points out that in drying the grain subsequently to the steeping, the solution left on the surface of the seeds may become sufficiently concentrated to be toxic to mould spores.

**CEREAL AND  
PULSE CROPS**

798 - **Wild Wheat in Palestine.** — COOK, O. F. — *U. S. Department of Agriculture Bureau of Plant Industry, Bulletin 274*, 56 pp. Washington, April 1913.

Following on the discovery of a new wild wheat by M. Aaron Aaronsohn, director of the Jewish Agricultural Experiment Station at Haifa, Palestine, the writer was instructed in 1910 to make further investigations of the subject. The present bulletin includes an exhaustive study of the plant in its native habitat and shows that normally it is a cross-fertilized species. It is widely distributed on the Anti-Lebanon range of mountains in northern Palestine and Syria, and is specially abundant on limestone formations. Its behaviour suggests the possibility of acclimatization in the south-western portion of the United States, where it may be of value both for crossing purposes and as a fodder plant, and trials are being carried out to that effect.

**FORAGE CROPS,  
MEADOWS  
AND PASTURES**

799 - **Sudan Grass, A New Drought-Resistant Hay Plant.** — PIPER, C. V. *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 125*, 20 pp. Washington, May 1913.

Seed of the grass *Andropogon halepensis* was imported into the United States from the Sudan in 1909, and has been tried in Texas and other parts of the semi-arid zone. The grass yields well in specially dry seasons and the fodder is much appreciated by stock. Large quantities of seed are now being grown and the crop promises to be a valuable acquisition to dry land farmers.

**FIBRE CROPS**

800 - **Projected Revival of the Flax Industry in England.** — VARGAS EYRE, J. in *Science Progress*, Vol. VII, No. 28, pp. 596-628. London, April 1913.

The cultivation of flax in England has always been subject to rather wide fluctuations, and though as late as 1870 23,957 acres were under the crop, the area gradually declined, and has been quite insignificant since 1890, the markets being supplied by Russian fibre. Of late years, however, the linen industry in Russia has developed enormously, and it is now able to deal with all the best quality fibre produced in that country, so that prices have risen to almost twice their value of ten years ago and the possibility of reintroducing flax as a remunerative crop in England has received the attention of the Commissioners appointed under the Development Act. To this end the writer was appointed in 1911 to gather first-hand information about the crop by studying its cultivation in Russia, Holland, Belgium, France, Ireland, Austria-Hungary and Germany. Moreover, certain field experiments were conducted last year in Bedfordshire, where, besides raising the crop, retting experiments were made in tanks specially constructed for the purpose.

A Report of the enquiry was made to the Commissioners, who kindly gave their consent to the publication of the above article which summarises the document.

The Report leaves no doubt that the climate and soils in many parts of England, notably in Yorkshire and Somerset, as well as in the Midland and Eastern counties, is well adapted to the production of high quality fibre, and though its cultivation is somewhat more troublesome than that of ordinary farm crops, no difficulty should be encountered in that connection provided that practical information can be placed at the disposal of the farmers. In order to produce high quality fibre, the process of retting and scutching requires skilled labour which could not be supplied by ordinary farm servants, and it seems advisable that it should be undertaken by specialists; the all important question is, then, whether the after treatment of the crop can be dealt with in such a manner that remunerative prices can be offered to the farmers for growing the crop. The general evidence is undoubtedly favourable, but only practical trials can afford definite knowledge, and recommendations for the establishment of one or more small retting depots, each capable of dealing with the produce of 100 acres, were made in the Report. The gain to British agriculture, should the experiment prove successful, is held as an ample justification for the expenses that would be incurred. The recommendations were favourably received by the Commissioners, and a society has been formed under strict conditions of non-profit trading in order that it may be eligible for a grant under the Development Act.

The Bedfordshire trials in 1912, alluded to above, were made to include trials of varieties of seed procured in Russia and in Holland and the effect of adding muriate of potash at the time of sowing. Though care was observed not to select exceptionally favourable soil, the crops generally were good. Some difficulty was experienced in getting the crop weeded and pulled, but the villagers displayed some anxiety to do their best and their services became more useful as they became more familiar with the work. Female labour in the fields was abundant. Attempts made to construct a filter bed for purifying the effluent from the retting tanks, though not altogether successful, indicated that the method might eventually prove useful, and further trials will be carried on during the present season. It is hoped at the same time to conduct some more systematic experiments with a view to gaining experience for the subsequent establishment of a small retting station.

801 - Cotton in Egypt and the Anglo-Egyptian Soudan. *Official Report International Federation of Master Cotton Spinners' and Manufacturers' Associations*, pp. 1-347. Manchester, March 1913. — DUDGEON, G. C. in *Bulletin of the Imperial Institute*, Vol. XI, No. 1, pp. 90-101. London, January-March 1913.

At the October meeting of the International Cotton Committee in Berlin in 1911 it was decided to send Mr. Arno Schmidt, the Secretary of the International Federation of the Master Cotton Spinners' and Manufacturers' Associations, to Egypt to prepare an itinerary for a tour of investigation by members of the Federation; and, as a result, Mr. Arno Schmidt visited Egypt at the end of the year and wrote a very valuable report of his visit. In October 1912 the International Congress met in Egypt, where they had the opportunity of holding important discussions with various re-

representatives of cotton-growing interests in Egypt. The delegates moreover decided that Mr. Arno Schmidt should proceed to the Anglo-Egyptian Sudan and report on that country with a special view to its possibilities with regard to the production of cotton. The reports of Mr. Arno Schmidt's two journeys, together with that of the visit of the Congress, and an appendix containing original articles by various technical experts, a few official documents relating to the matter treated, and some useful cotton statistics, are published in the above volume and form a valuable contribution to our knowledge of the Egyptian cotton question at the present day.

The deterioration of the Egyptian cotton crop formed the basis of a large number of the discussions. The decline in yield is a very real one and cannot be attributed to the fact that fresh lands are being used for the production of cotton which are less fertile than the older ones, for on old estates the decline is equally evident. The loss of quantity has been the subject of much complaint amongst spinners for some time past.

The causes for this deterioration are numerous. Amongst the most important may be mentioned the mixing of varieties: as cross pollination is a very usual phenomenon in the cotton plant the introduction of a few seeds of an inferior grade very soon begins to affect the bulk and, together with the complete lack of appreciation of the necessity for any seed selection by the native cultivator, has undoubtedly had an important share in the reduction of both yield and quality. Another set of causes may be grouped together under the heading of bad cultivation and are chiefly due to the difficulty of educating the fellah. By long use, agricultural procedure has become a part of the people themselves, and even with altered circumstances the necessity of reforms or modifications is rarely recognised. For instance, the difficulty of obtaining sufficient Nile water is such an established principle, that the possibility of using too much is hardly considered, and as a consequence the cotton fields suffer from over watering. This, together with the practice of planting too closely and not caring properly for the inter-spaces, stifles the crop and tends to its deterioration; moreover the close foliage thus obtained forms an admirable protection to the insect pests, the severity of whose periodical visitations has been a marked feature in the last decade. The crop, too, now appears twice in the rotation of three years instead of once as formerly. Lastly, the raising of the level of the water in the canals, together with the absence of natural drainage, has been conclusively proved to cause waterlogging of the soil and asphyxiation of the plants.

With such a list of noxious influences the wonder appears to be rather that the plant could exist at all than that the yield and quality had been reduced; but with a thorough appreciation of the gravity of the position, far-reaching remedial measures have been inaugurated, the effects of which will probably make themselves felt before long.

In the first place, a Botanical Laboratory and Plant Breeding Station has been established at Giza under the direction of Mr. W. L. Balls, where much valuable research work has already been done, and with this as a source of new varieties specially adapted to the conditions of the country the Government have undertaken their propagation and final distribution

of the seed to the farmers under the most favourable terms. For some time past the best and purest seed in the country has been obtainable from the State Domains, but only the larger farmers availed themselves of this supply. The Government is now taking up the distribution amongst the smaller farmers and it is further suggested that the State should make the sale of cotton seed a licensed trade in order to prevent altogether the disposal of inferior seed. The Government too has established a number of demonstration farms to educate the fellah in the matter of cultivation, and these have been so successful that they are being repeated in all parts of the country.

With regard to the insect pests a Commission has recently been appointed to study the subject thoroughly. It is hoped that they may find a means of checking the ravages of the pests by the introduction of an internal parasite of the cotton worm such as exists in India, where the cotton worm is a common insect but has never been observed as a pest on the cotton crop.

The question of drainage too is occupying much attention; a great scheme for the relief of those areas in the Delta which suffer most has now been commenced by the Government but will take many years to complete. The chief difficulty lies in the low level of the land and the necessity of lifting the water to higher levels by means of a pump in order to get rid of it. At the same time, now that the raising of the Assuan dam has provided the necessary water supply, the new drainage system will also make it possible to reclaim large areas of salted land in the lower part of the Delta.

In the Sudan, the cotton-growing districts may be considered under four headings:

#### *I. Flood Irrigation.*

This includes the Tokar district where 50 000 feddans (1) are under cotton and the Kassala district where 4 000 feddans are under cotton. They are watered by the flood water of the Khor Baraka and the Gash respectively. Both these rivers come from the mountains of Abyssinia and Eritrea, and are in flood from July to September, at which period only they reach the sea. The water thus obtained, together with a rainfall of about 6 inches per annum, is sufficient to raise a cotton crop which averages about 400 lbs. of seed cotton per acre, but which can easily be raised to 700 lbs. of seed cotton with a little care. Cultivation is very primitive and the fact that the rivers have a habit of flowing in different districts from year to year does not encourage the cultivators to prepare their land in advance. Only the best quality cotton is grown by the natives and the seed is supplied by the Government who also exert a controlling influence on the Tokar market by having an official classifier for grading the crop. With a proper control of the flood water large areas of suitable land could be brought under cultivation, but railway communications must also be established before the districts can be developed.

(1) 1 acre = 0.936 feddan.

## II. *Pump Irrigation.*

This is practised in the districts north of Khartoum where the climate is not particularly well adapted to cotton. Plantations are still almost in an experimental stage and the Zeidab estate of 10 000 feddaus run by the Sudan Plantation Syndicate is the most flourishing example.

## III. *The Ghezira.*

This district consists of the triangular piece of land between the Blue and the White Nile south of Khartoum. Here the rainfall gradually increases as we go south and the climate generally is more favourable to cotton than in the district north of Khartoum. A great irrigation project has been formulated by Sir William Garstin for establishing a barrage at Sennar on the Blue Nile and cutting a canal from there parallel to the Blue Nile to a point about 40 miles south of Khartoum. This would eventually lead to the irrigation of 1 000 000 acres at an estimated cost of £6 000 000. In the meantime a test farm was started 2 years ago at Tayiba where about 2 000 acres are now irrigated by means of a pumping station. The management of the farm has been given to the Sudan Plantation Syndicate who had the experience of their other plantations to guide them and were able to induce trained farmers to come from Zeidab and teach by their example the inhabitants of the Ghezira the proper way of growing cotton. The experiment has been a complete success. Natives are clamouring to be allowed to become tenants and the cost of producing cotton is very little higher than in America. It would seem advisable before embarking on the main irrigation scheme to repeat these test farms in two or three other parts of the Ghezira in order to be quite certain that other soils are equally suitable and to ascertain through actual experience the cost of excavating the channels in the various parts of the Ghezira, and, at the same time, to educate the inhabitants in cotton growing and to await an increase in the population to take up the holdings.

## IV. *Rain Grown Cotton.*

Suitable districts for this form of cultivation occur south of Sennar and in the southern portion of the Kassala province. The methods of cultivation are very primitive and only American varieties flourish. So far about 1000 tons of this kind of cotton are produced annually but the possibilities of extension are said to be very great.

In conclusion it may be added that in the debate which followed the reading of the King's speech at the opening of the British Parliament in March 1913, the Right Hon. H. H. Asquith, Prime Minister, said: « I may say, as to the Sudan loan, that the maximum amount we propose to ask is £3 000 000 in instalments, and I believe that prospects of its development are such as to afford ample security. »

802 - **Egyptian Cotton Culture in the Southwest (United States).**—SCOTFIELD, C. S. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 123*, pp. 21-28. Washington, April 26, 1913.

Extensive trials of Egyptian cotton were made in irrigated districts of Arizona and California during the season 1912. Seed was distributed

to 75 farmers and about 530 acres were planted. The yield per acre varied from 400 to 700 lbs. of lint, which fetched the same price as imported Egyptian, and the results in general appear to justify further trials on a still larger scale.

803 - **Ground-Nut in Gujerat.** - SANE, C. V. in *The Agricultural Journal of India*, Vol. VIII, Part II, pp. 178-184. Calcutta, April 1913.

OIL CROPS

A short article showing that the cultivation of ground-nuts, after having first been tried at the Government Farm, Surat, is slowly extending over South Gujerat. The crop is liable to damage by birds, beasts and thieves, and the cost of cultivation and harvesting are very high; but good yields up to 2 600 lbs. per acre are obtained, and the possibility of large profits may induce cultivators to adopt it as a regular crop in their rotation.

804 - **The Nicotine Content of Hungarian Tobaccos.** - TOTI, GYULA *Magyar Dohányníjség*, Year XXX, No. 9, 5 pp. Budapest, May 5, 1913.

VARIOUS CROPS

The continuation of a series of experiments regarding the nicotine content of Hungarian tobaccos (1). The writer effected the complete extraction of nicotine from tobacco leaves destined exclusively for the Hungarian factories.

Hungarian tobaccos are mostly not manufactured till two or three year after the leaves have been gathered. The writer has found that the nicotine content of the leaves diminishes during this time, a fact which is especially advantageous in the case of these tobaccos from the consumer's point of view, as the original amount of nicotine present is very large.

The writer examined first and third class tobaccos of the following varieties from the crops of 1907 and 1910: Debreczen, Tisza, Szeged, fine garden, semi-fine garden, Muskátaly and common tobacco. The samples having been taken from nearly all the districts supplying the Tobacco Department, the data obtained can be generalised.

Table I shows the nicotine content of the different varieties.

TABLE I.

Variety	No. of samples examined	Minimum %	Maximum %	Average Content %
Debreczen . . . . .	24	1.8	4.5	3.0
Muskátaly . . . . .	25	1.7	5.3	3.1
Tisza . . . . .	16	2.5	4.6	3.8
Semi-fine garden . . .	65	0.5	3.6	1.6
Szeged . . . . .	13	1.4	6.2	3.7
Common . . . . .	5	1.4	5.9	4.3

Hitherto the diminution of the nicotine content during the keeping of tobacco was a mere hypotheses.

(1) See *Magyar Dohányníjség* Nos. 17 and 11, 1911.

(Author's note)

Table II gives the nicotine loss in 12 samples of tobacco analysed at different dates.

TABLE II.

Variety and Quality	Nicotine per cent.		
	at the beginning of the experiment	after 6 months	after one year
Szeged I . . . . .	2.2	2.2	2.2
Tisza I . . . . .	4.6	4.4	4.4
Tisza I . . . . .	4.2	4.0	4.0
Muskatály I . . . . .	4.4	4.1	3.7
Semi-fine garden I . . . . .	1.9	1.6	1.6
Debreczen I . . . . .	4.4	4.4	4.4
Muskatály III . . . . .	2.2	2.2	2.1
Debreczen I . . . . .	4.2	3.9	3.9
Semi-fine garden III . . . . .	1.1	1.1	1.1
Muskatály . . . . .	3.1	3.1	3.1
Semi-fine garden . . . . .	1.6	1.5	1.5
Common III . . . . .	1.4	1.4	1.4

These results show that tobacco kept for a long time in a dry place may lose a certain proportion of its nicotine content.

805 - **Economic Results of Cultivating Heavy Tobacco Crosses Resistant to *Thielavia basicola*.** — AIELLI DONNARUMMA in *Bollettino tecnico della coltivazione dei tabacchi pubblicato per cura del R. Istituto Sperimentale in Scafati (Salerno)*, Year XII, No. 2, p. 89 + figs. Scafati, March-April 1913.

A supplement to the observations published in No. 5 of the above-mentioned periodical for 1911 and No. 6 for 1912 (1). The economic results obtained in cultivating tobacco in the Province of Salerno are given in a table. While the Kentucky variety there only yields a gross return of about £ 24 per acre, the heavy crosses (Italia × Kentucky, Salento × Kentucky, Moro × Kentucky) yield a gross return of from £ 28 to £ 35 per acre. This result is the more important, seeing that this type of tobacco is also superior from an agricultural and an industrial point of view.

806 - **Observations on the Preparation of Cacao.** — FERROLI, E. in *Comptes rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 18, pp. 1394-1396. Paris, May 5, 1913.

The cacao which finds its way to the European markets from the countries where it is produced undergoes fermentation after being gathered. The conditions of this process are as yet undetermined, with the result that the cacao-making industry has to deal with an extremely variable product. The operation has the double aim of destroying the sweet muc-

(1) See No. 234, B. Jan. 1912, and No. 520, B. May 1913.

(Ed.).

luginous pulp which adheres closely to the seeds of the fruit, and to produce useful chemical changes in the kernel.

In a first series of studies, undertaken with the object of making the preparation of cacao more systematic and less difficult, the writer found that the method at present in use could be modified with advantage by using a mechanical process for removing the pulp after a preliminary treatment of the fruit with a weak alkaline solution: The fresh seeds are macerated for some hours at a temperature of 45° to 50° C. in a 1 per cent. sodium carbonate solution and are then left in a warm, damp spot until the pulp has undergone sufficient transformation. Unfortunately, this process gives every opportunity for the growth of moulds, and for this reason the writer has undertaken new investigations with a view to sterilizing the fresh seeds.

By the simple action of steam under slight pressure in an autoclave, seeds were obtained which after the pulp had been removed mechanically presented an excellent appearance. The flesh of the kernel retains its beautiful violet colour after desiccation, showing that the tannic compounds had undergone no chemical change. The sterilized seeds were reduced to powder and then subjected to two kinds of tests, the one of a chemical, the other of a biological nature. From these it was concluded that it is possible to obtain changes in this sterilized powder in the laboratory which are comparable to those in the course of the present method of preparation as practised in the countries where the cacao is grown and that the latter would derive considerable benefit from the adoption of the new process.

807 — **New Kitchen Garden Plants** (1). — DUBOIS P. in *La Vie Agricole et Rurale* Year 2, No. 23, pp. 671-673. Paris, May 10, 1913.

MARKET  
GARDENING

*Very long Aubergine, Perfection.* — Very hardy and early as well as unusually productive. Each plant (about 3 ft. in height) bears 15 to 20 fruits, up to 12 inches long and 2 to 3 inches in diameter; the fruits are nearly cylindrical, of a fine dark violet colour and travel well.

*Improved white Cardoon.* — This is distinct from other varieties on account of its very wide, thick, full, tender, fleshy ribs, which, so to say, whiten of their own accord; vigorous, hardy, and without spines.

*Improved Saint Fiacre Carrot.* — A good variety as regards fine flavour, shape and colour; it is the result of long continued selection of the ordinary Saint-Fiacre variety and belongs to the short, red, early type.

*Cauliflower, Marvel of All Seasons.* — This variety has a short stem and green foliage, is erect and regular and resembles the half-hard Paris variety. Its large heads, nearly covered by the leaves, are very white and fine, and close-grained in texture. Their quality is excellent and their development very rapid. The early growth of the head makes this variety suitable for forcing, while as it resists not only spring frosts but also excessive heat in summer it is equally adapted to planting in the open.

*Early Cabbage, King of the Markets.* — One of the earliest summer cab-

bages. The head is large, round and very firm, rising from amidst, fine, glaucous, rounded foliage.

*Improved Rochford Cucumber* — The favourite variety in England. The foliage is abundant and the plant produces a quantity of fruit with firm flesh, and of a delicate green, recalling by their shape the Improved Telegraph Cucumber, but with more prominent spines.

*Green Water-Melon from Tripoli (non-running)*. — This variety, which is very common in Egypt, has straight, elongated, well-shaped fruits, which when completely developed are of a uniform dark green. The plant is vigorous and very prolific, has divided leaves, and is resistant to heat.

*Extra-early dwarf "Mangetout" Haricot with green seed*. — This variety presents the same advantages as the extra-early dwarf white Mangetout, but in addition, produces a green seed like that of the green kidney bean, if properly dried in the shade before being completely ripe.

*Red winter G. N. Lettuce*. — These lettuces, though small, produce heads of a nice shade of green tinged with copper colour, and are crisp with an excellent flavour. They pack and travel well.

*Marteau Turnip for forcing*. — Very early, has little foliage and grows rapidly, being thus especially adapted for first sowings under glass, as an early vegetable, or for late sowings. The shapely clean very white root resembles in shape the Marteau form of the Des Vertus turnip. Its flesh is fine and sweet.

*Colossal Virgin Sorrel*. — Has remarkably large leaves, still larger than those of the Blonde Lyons.

*Express Mangetout Pea*. — A half-tall variety (3 ft. 6 in.) producing abundance of fine large pods; very early.

*Mammoth wrinkled dwarf Pea*. — Early, coming in immediately after the very early varieties; produces a large number of pods.

*Wrinkled tall pea, Sensation*. — The result of a cross between Alderman and Edwin Beckett. This new hybrid resembles both its parents in habit, and like the first is remarkable for its resistance to heat and for its productiveness. The strong, solid stems are provided with ample foliage, and attain a height of about 5 ½ feet. They are covered with pods, usually in pairs, 6 to 7 inches long, very full and containing 11 or 12 large green sweet melting peas of excellent flavour, which remain tender even if picked when almost ripe. A mid-season variety.

*Oval white summer Radish*. — The root is smooth, very clean, and well-shaped; the flesh is fine, and very full and has an excellent flavour; as the roots do not become hollow early, they need not be eaten till they are nearly full grown. This variety does not split, even in very wet weather.

*Dwarf extra-curled parsley, Perfection*. — The leaves are very fine and curly.

## 308 - A Comparison Between the Cuttings of Grafted and Ungrafted Vines (1).

FRUIT-GROWING

— BACO, F. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No 15, pp. 1167-1169. Paris, April 14, 1913.

The writer has shown in a preceding paper that "Grafting does not preserve absolutely the characters of the associated vines forming respectively the stock and the scion.

"There are cases where modifications of these characters are observed or the reciprocal transmission of certain other characters, which are regarded by writers on vine-growing as primordial or definitely acquired. Any particular character possessed by a hybrid can be accentuated or diminished, that is to say systematically modified, by grafting on suitable stocks (2)".

In continuing his investigations, M. Baco proposed to discover whether variations thus obtained persist, or increase, in propagation by slips, and whether they are accompanied by changes in the root system.

On February 10, 1911, ten slips as similar as possible were taken from each of eight types mentioned later (two controls and six subjects of experiment); variations in these vines had been observed in the writer's experiment field at Bélus (Landes).

The vines were planted separately in good, friable, homogeneous soil and at the same depth; they were left for 2 years without other care than hoeing, and the spraying necessary for keeping them in good health; all the vines were treated alike. The writer determined, chiefly in 1912, and in particular on August 28 and October 20 of that year, that the characters acquired by means of grafting had persisted; in particular, those of colour, habit, vigour, leaf-fall, and resistance to mildew. On up-rooting the vines on January 28, 1913, M. Baco further found that the parts below ground had undergone changes in accordance with those of the parts above ground.

Plants derived from grafts showed the following differences from those taken from ungrafted vines:

*Ungrafted Baroque*. — Roots going deep (35°), fleshy, with rootlets.

*Baroque from graft on 1202*. — Roots going somewhat deep (55°), fleshy and fairly rich in rootlets.

*1202 from graft on Baroque*. — Roots spreading (70°), very fleshy, with rootlets.

*1202 from plant on its own roots*. — Root going somewhat deep (54°), very fleshy, and rich in rootlets.

*Baroque from graft on 157<sup>11</sup>*. — Roots somewhat spreading (60°), fleshy, and with many rootlets.

*Baroque from graft on Rupestris du Lot*. — Roots going somewhat deep (50°), very fleshy and very plentifully supplied with rootlets.

*Baroque from graft on 3309*. — Roots somewhat spreading (65°), fleshy, very rich in rootlets.

*Baroque from graft on 101<sup>14</sup>*. — Roots going somewhat deep (55°), somewhat fleshy, and with many rootlets.

From these experiments "it may be concluded that, in the cases of the grafted Baroque and grafted 1202 at Bélus, as well as in those of this Vini-

(1) See No. 138, B., Feb. 1913.

(Ed.).

(2) F. BACO, *Sur des variations de vignes greffées*. — *Comptes Rendus*, Feb. 15, 1909.

(Ed.).

fera grafted on 157<sup>11</sup>, Rupestris du Lot 3309, and 101<sup>14</sup>, certain specific variations due to grafting have proved to be transmitted by slips, and that the modifications of the parts of the plant above ground have been accompanied by important specific changes in the root system".

809 - **Late Pruning**. — RAVAZ, L. in *Le Progrès Agricole et Viticole*, Year 30, No 17, pp. 517-518. Montpellier, April 27, 1913.

The following table gives the results obtained in 1912 at the Montpellier School on a plot of vines devoted to the determination of the influence of the pruning time upon vegetative phenomena.

No. of Row	Destroyed eyes %
9 Pruned in September, after the vintage . . . .	37.70
10 Pruned on the fall of the leaves . . . . .	74.00
11 Pruned the end of December . . . . .	61.00
12 Pruned when the sap began to rise . . . . .	31.50
13 Pruned at the opening of the buds . . . . .	4.80
14 Pruned when the shoots were 5-6 cm. long . .	0.00

The following tables give the wood and fruit production.

		Weight of wood per vine in ounces								
		1905	1906	1907	1908	1909	1910	1911	1912	Average
Row	9 . . . .	11.5	18.0	22.0	14.0	14.4	16.8	21.2	23.9	17.7
"	10 . . . .	11.7	21.2	21.6	19.6	26.2	29.0	28.9	28.6	23.4
"	11 . . . .	11.1	16.3	23.2	16.6	20.3	23.5	21.2	23.7	19.5
"	12 . . . .	13.7	16.7	19.4	16.5	18.4	24.1	21.1	22.6	18.7
"	13 . . . .	13.8	18.9	18.9	15.9	21.2	23.4	19.1	23.4	18.8
"	14 . . . .	14.8	17.4	17.8	19.7	23.1	21.2	21.4	26.9	20.0

Thus, the latest pruned row always takes a good place.

		Number of bunches per vine					
		1908	1909	1910	1911	1912	Average
Row	9 . . . .	12.15	17.2	16.7	15.3	12	13.72
"	10 . . . .	12.45	14.6	18.8	18.1	15	14.44
"	11 . . . .	14.85	18.6	16.7	17.4	13	15.30
"	12 . . . .	14.55	19.8	19.7	20.0	12	17.22
"	13 . . . .	18.30	20.5	19.4	19.6	14	18.54
"	14 . . . .	14.55	17.7	18.1	20.1	19	19.60

Production per vine in ounces

	1906	1907	1908	1909	1910	1911	1912	Average
Row 9. . . .	47.0	149.9	143.3	92.1	96.0	64.7	38.2	90.1
10. . . .	27.8	145.0	125.6	152.8	143.0	80.3	78.8	107.6
11. . . .	36.2	120.3	109.2	107.8	124.5	67.8	55.5	88.8
12. . . .	44.5	134.4	141.1	134.4	136.9	40.8	82.3	107.3
13. . . .	40.3	168.0	141.1	120.7	131.8	83.5	74.2	108.8
14. . . .	55.7	157.7	147.7	125.4	123.4	102.8	62.2	110.7

In order to make the data complete, the production per vine is given, but the figures for 1912 are of no value, as all the rows were tested by an artificially caused attack of mildew.

**810 — Planting Northern Vineyards and Forcing-Houses with the Assistance of American Stocks.** — PROSPER, GERVAIS in *Le Progrès agricole et viticole*, Year 30, No. 21, pp. 648-657. Montpellier, May 25, 1913.

Phylloxera still continues its devastating course, for though its progress has been somewhat checked in the Northern and North-Eastern districts, where the climate is cold and damp, this does not prevent the systematic destruction, and the undoubted disappearance of old vineyards. And then there will arise in those districts, if it has not already arisen, the question of whether it is well to replant the vanished vineyards, of the conditions under which this could be done, together with the means and methods to be adopted to carry out the work.

The writer considers that the reconstitution of northern vineyards is wonderfully simplified by the use of American stocks or their hybrids, on account of the undoubted advantages accruing from grafting, *viz.* earlier maturity, and increased yields of better-developed and improved fruit.

The satisfactory results of grafting should be seconded and completed by the choice of the grafts. These should be carefully selected and have reached the first stage of maturity. It would be well further to choose only white varieties.

The stocks which seem most suitable to the soils and climates in question are: the Berlandieri hybrids (Vinifera-Berlandieri, Berlandieri × Riparia); the Riparia hybrids (Solonis × Riparia, Riparia × Rupestris); the hybrids of Cordifolia (Cordifolia × Riparia, Riparia × Cordifolia-Rupestris, Solonis × Cordifolia-Rupestris); these are preferable to Rupestris du Lot and to hybrids of Vinifera × Rupestris, whose well-known faults should prevent their being used.

The building of forcing-houses and the cultivation under glass of American stocks, or hybrids, will open up new resources, and bring the

vine-growing industry the elements of true progress, of development, and of continued prosperity.

511 - **Horticultural Research: the Action of Grass on Trees.** — PICKERING, S. in *Science Progress*, Vol. VII, No. 28, pp. 490-503. London, April 1913.

The harmful influence of grass on fruit trees varies considerably with the nature of the soil and the method of treatment. Young trees planted in land already grassed or put down to grass immediately after planting suffer most, while if grass is merely allowed to establish itself slowly in an older plantation the effect seems to be reduced to a minimum. But the action is a perfectly general one, and with one single exception has been observed in all parts of England and in all classes of soil. The visible effect is not confined to stunted development, but is manifest too in the altered colour of bark, leaves and fruit.

Numerous possible causes of these changes have been investigated, foremost among which are lack of water and plant food owing to the competition of the grass. Trees under grass were watered by means of tubes so that the soil in contact with their roots was moister than the adjacent tilled soil, and observations taken one season showed that the moisture content in soil under grass was never reduced below the optimum point, yet in both cases the trees were obviously less healthy than similar trees in tilled soil. In other experiments carried out in pots the grass roots were prevented from coming in contact with the tree roots by a sheet of fine gauze placed about 4 inches below the surface, and plant food was supplied from below, yet even under these conditions the trees suffered from the grassing. Added to this, the general conclusions that trees in tilled soil do better in dry years than trees in grassed soil in wet ones, also that soil under grass is usually richer than tilled soil, dispose of the water and food supply as possible causes. Feeding the grass with sheep does not improve matters, and the effect of keeping poultry in grass orchards is now being investigated. Mechanical analyses of the soils failed to reveal any contributing cause, nor was the effect simulated when the soil was made alkaline. Lack of aeration would not appear to be of importance from a consideration of the iron drum experiments described in a previous article (1) and of the fact that trees were grown in a soil artificially enriched with carbon dioxide without disturbance, and it is equally impossible to make differences in temperature between grassed and tilled soils account for the phenomenon. Finally, bearing in mind all the available evidence, the writer was led to the conclusion that the action must be due to some *toxic effect*, using the term in its wider sense to mean the presence of some poisonous substance in the soil, without defining its direct source; this hypothesis is certainly confirmed by the following experiment: trees were planted in pots, the surface of which was covered by moveable perforated trays on which the grass was grown. In spite of the complete

(1) See No. 378, B. April 1913.

(Ed.).

separation of the grass from the tree roots, the growth was reduced by 25 per cent; when, however, the drainage from the grass was collected and left exposed to the air some time previously to being used on the tree, the effect was beneficial. These results indicate that the trees suffer by reason of something added to rather than removed from the soil, also that by oxidation the toxin is converted into plant food.

Now when a soil is heated, the amount of soluble organic matter it contains is increased, and at the same time the soil becomes toxic to germinating seed. Both these effects are considerable at 150° C., but diminish with the temperature; they are still recognisable at 60° C. and probably begin to operate at 30° C. A similar effect is obtained when a soil is treated with antiseptics, and the toxic substance decomposes gradually if the soil is aerated and moistened, but remains unaltered for several months if air is excluded from the soil; the rapidity with which the toxin is formed indicates that it is a direct and unstable product of chemical reaction. The soluble organic matter also decreases with time, but not as rapidly as the toxin, so that when the latter has completely disappeared some excess of the soluble organic matter is left over and accounts for the increased fertility of the treated soils. Tomato and tobacco plants grown in soil heated to 30°, 60°, 80°, 100°, 125°, and 150° C. respectively clearly showed the effect of these two opposing factors; after a preliminary check the plants grown in the soils heated to the lower temperatures recovered and were able to profit by the increased nitrogen supply, but when the soil had been heated beyond a certain point, the check was too prolonged and the plants never caught up lost time, so that it required a second crop to show the effect of the increased nitrogen supply. The results varied a little according to the sensitiveness of the plants, but on the whole the results justify the conclusion that the oxidisable substance which is toxic to seeds is also toxic to plant growth. In order to extend the experiments to trees, the aeration of the soils was restricted by enclosing them in bottles, and under these conditions the toxic effect of those heated to 125° and 150° C. became noticeable.

Coming back to the question of grassing, a somewhat analogous case is presented when soil is first uncovered by the removal of grass; it does not behave normally at once, but after exposure to the air becomes more favourable to plant growth than ungrassed soil, owing to the presence of a larger amount of nitrogenous and organic matter. The resemblance between the behaviour of grassed and heated soils is shown in yet another manner: owing to the presence of some oily or waxy substance heated soils are more difficult to wet than unheated soils, and this peculiarity is reproduced to a lesser degree in grassed soils. On the other hand grassed soils have never proved toxic to germinating seeds, so that the connection between the two cases is not established, though they undoubtedly have some points in common.

The writer is unable to accept Russell and Hutchinson's hypothesis of protozoa as the limiting factor in soil fertility, for on this hypothesis a maximum fertility should be obtained by heating soils to 50° C., at which temperature protozoa are killed with least injury to bacteria. He points

out that his experiments do not confirm this view; but, he adds, on the other hand if the process is a purely chemical one resulting in the formation of a toxin it seems difficult to believe that the plant food liberated by heating a soil to 100°C. would be sufficient to account for the extra vigour of plants. He concludes by saying that "both explanations are probably correct but neither alone affords a full explanation of the facts".

812 - **The Plum Industry in Servia.** — STOKOWITZ, W. in *La Vie Agricole et Rurale*, Year 2, No. 21, pp. 616-619. Paris, April 26, 1913.

*The importance of plum cultivation.* — Plum growing and the various industries connected with it form a very important source of the revenue of Servia. Plums, under different forms, are exported annually to the value of nearly a million sterling.

Plums occupy a much larger area in the country than any other fruit trees, and are especially grown in the West and Centre of Servia, particularly in the departments of Kraguyévatz, Valyévo, Podrinje, Rudnik, Chachak, Ujitzé and Kruzhévatz. The following figures give an idea of the importance and the development of plum cultivation in Servia :

Year	Area under plums acres
1889 . . . . .	157 750
1900 . . . . .	251 000
1906 . . . . .	326 500
1911 . . . . .	346 500

By far the most widely grown variety is Projegatcha (Lorraine plum). The trees are usually propagated by means of suckers taken from below the trees in old orchards; after planting they are left to themselves, but there is a marked tendency towards more systematic cultivation.

The prosperity of plum growing is entirely due to the plum industries in Servia. About two-fifths of the total crop is dried, one-fifth is made into preserve, while the remaining two-fifths are used for the manufacture of plum brandy ("rakia" or "shlivovitza"), with the exception of a very small quantity exported as fresh fruit, chiefly to Germany; these are the finest fruits hand-picked before they are quite ripe. The home consumption also is included in the last-mentioned two-fifths.

*The prune industry.* — This industry is much developed and is very prosperous, Servian prunes being celebrated abroad. The somewhat primitive drying apparatus, the "puchmitza" (a kind of baker's oven), and Glavinitch's oven, hitherto employed, are about to be replaced by a very much better apparatus which has been selected from the exhibits of many oven competitions organized by the Government.

The principal plum markets are held daily (except Sunday) from the 1st of September (old style) to the end of November, in the following towns: Belgrade, Shabatz, Kraguyévatz, Valyévo, Chachak, Obrenovatz, Arandjelovatz and Loznitza. The Servian Government takes special measures throughout the plum season to prevent the sale of damaged or inferior fruit,

and to prevent fraud. The prunes are sold by weight and also according to the number per pound. They are sorted in the salesmen's store rooms by means of sorters with sieves of different dimensions. The classification of prunes adopted in the Servian trade is, in general, as follows:

60-65	fruits per pound	"Chestizé"
70-75	" "	"Sedmitzé"
80-85	" "	"Osmitzé"
95-100	" "	"Stotunké"
115-120	" "	"Usance"
120-130	" "	"Mercantil"

The exported prunes are dispatched in sacks containing 130 to 180 lbs. or in boxes of 26 to 55 lbs. In the latter case, the prunes are placed in the oven after packing, as in the common French method. Prunes are chiefly exported to Austria, Germany, Belgium, Holland, Denmark, England, Switzerland and Russia. They form an important article of commerce: the exports amounted to between 40 000 and 50 000 tons from 1904 to 1908, then fell to 9 000 in 1909, and were respectively 23 500 and 32 750 tons in 1910 and 1911; the highest value in the ten years 1902 to 1911 was in 1911, viz. £ 654 500; it was nearly the same in 1907, and over £400 000 also in 1906, 1908 and 1910.

*The manufacture of plum preserve.* — This jam is made of completely ripe plums, without the addition of sugar. The fruit is first cooked, in order that the skins and stones may be more easily removed, and is then boiled in special cauldrons 7 to 10 ft. wide and 24 to 28 in. deep. The cauldrons are heated over an open fire, as better results are obtained by this means than by steaming (as at Kraguyévatz). The prepared jam is placed in receptacles holding 12 to 15 gallons and exported abroad, chiefly to Austria and Germany. The exports averaged 13 000 tons from 1902 to 1908, then fell to 1 500 in 1909 and were 9 300 and 5 100 in 1910 and 1911 respectively; the greatest value in the 10-year period was in 1907 (£170 000), while in 1910 and 1911 it was £112 800 and £8 600 respectively.

The most important markets for plum jam are: Kraguyévatz, Chachak and Shabatz.

*The manufacture of plum brandy.* — Only fruit of inferior quality is distilled and that in very primitive apparatus; two kinds of brandy are made, one called "meka shlivovitz" (or mild) scaling 20° to 30°, and another called "liouta shlivovitz" (strong) or "prépétchénitza" (redistilled brandy) scaling 40° to 50°. Only the latter is exported abroad.

The exports of plum brandy (including a little pomace brandy) varied between 600 000 and 800 000 lbs. from 1903 to 1909, and in 1910 and 1911 were respectively 200 000 lbs. and 57 500 lbs.; their value reached over £4 000 in 1905, but was only £630 in 1911.

- 813 - **The Grafted Papaya as an Annual Fruit Tree.** — FAIRCHILD, D. and SIMMONS, E. *United States Department of Agriculture, Bureau of Plant Industry, Circular 109*, 13 pp. Washington, March 1913.

The Papaya or Papaw (*Carica papaya*) is a tropical fruit somewhat resembling a small melon and possessing a characteristic flavour. The leaves and unripe fruits contain the ferment papain. Hitherto its cultivation in Florida, where the fruit is much appreciated, has been impeded by the fact that its propagation from seed gave very uncertain results, while its propagation from cuttings was too slow to prove remunerative. One of the writers has now been successful in grafting desirable stock on young seedlings, so that a yield of 48 to 72 lbs. per tree may be obtained in 15 months. There are indications that the demand for papayas is growing and that the smaller fruits can be shipped to distant markets with success.

## FORESTRY

- 814 - **The Extraction of Resin from Pines in Corsica.** — DE LAFASSE in *Revue des Eaux et Forêts*, Vol. 59, Part II, pp. 321-334. Paris, June 1, 1913.

The forest conditions of Corsica may be summarized as follows:

*Classification according to ownership.*

Forests belonging to the State . . . . .	115 724 acres
{ to Communes . . . . .	{ subject to State easements 210 476 »
{ . . . . .	{ not subject . . . . . 29 979 »
to Private Owners . . . . .	74 780 »
Total . . . . .	430 959 »

Of this area, 326 200 acres are subject to State easements. Considering that 84 264 acres are bare, the really wooded area is 346 695 acres, or 16 per cent. of the total area; to which about 741 330 acres of bush (maquis) have to be added.

*Classification according to forest trees.*

Evergreen oak . . . . .	98 127 acres or 28 per cent.
Corsican pine . . . . .	89 281 » » 25 »
Maritime pine . . . . .	72 576 » » 23 »
Beech . . . . .	47 593 » » 12 »
Cork oak . . . . .	7 436 » » 3 »
Various . . . . .	31 680 » » 9 »
Total . . . . .	346 695 » » 100 »

As the above table shows, resinous trees prevail; of these the Corsican pine, almost always alone, forms the greatest stands of the island at from 3300 to 5 000 feet above sea level, while the maritime pine is met with at altitudes ranging from 330 to 3300 feet, but chiefly between 650 and 2600 feet.

Hence the eventual importance of the extraction of resin from these 161 800 acres of resinous woods.

The extraction of resin from the Corsican pine was begun in 1856 and actively pursued until 1867, during which time it was favoured by the

American civil war. The following account, which gives the yield of 8 seasons from 1869, shows the economic aspect of the industry :

Turpentine. . . . .	262 347 lbs.
Colophony . . . . .	282 807 »
Tar . . . . .	476 035 »
Total . . . . .	1 241 189 »

Referring this total production to the 45 921 trees utilized yearly, the yield per tree is 3.377 lb., the net return per tree being 0.57 d.

Considering the consequence of the extraction of resin from a cultural point of view the following chief drawbacks have been observed.

1. The failure of the wounds to heal when tapping without killing the tree is practised (*gemma à vie*).
2. Difficulty of extracting resin by tapping to death, and injury to the wood.
3. Difficulty of combining the extraction of resin with selection felling, which is the best for Corsican pine.

The tapping of Corsican pine being abandoned, the extraction of resin from the maritime pine began in 1900. Several concessions for felling combined with tapping to death and tapping without killing the trees were granted by the State and by the Communes. In 1912 the total production of raw resin in Corsica was 54 045 gallons. Among the producers of resin the "Térébenthine française" Company deserves to be mentioned.

The management by selection felling has to be harmonized with the industrial tapping of maritime pine for resin. The writer believes the problem might be solved by a selection system "en damier," that is dividing the forest into regular stands of graduated age, but in no fixed order, each of which would be successively submitted to thinning, preparatory or seeding felling and final cutting.

In conclusion, the extraction of resin from the maritime pine may be considered as established in Corsica, but in order that the tapping over the whole of the 72 576 acres under maritime pine should be as satisfactory as that conducted by the French Water and Forest Service, the three following essential conditions must be borne in mind :

- I. Labour must be introduced from abroad.
- II. The means of communication must be good so as to render the day's yield profitable.
- III. The tapping installations must be sufficiently near each other and conveniently grouped, for the same reason.

## LIVE STOCK AND BREEDING.

## HYGIENE

815 - The Action of Arsenical Dips in Protecting Cattle from Infestation with Ticks. GRAYBILL, H. W. — U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 167, 27 pp. Washington, April 15, 1913.

In this bulletin, the writer discusses the factors entering into the efficacy of dips used against the ticks which infest cattle. Dips act both in a direct destructive way and in a protective manner. The protective result may be in the nature of a destructive or a repellent action. The influence of dips on oviposition and the viability of the eggs is a factor in efficacy.

Mr. Graybill's investigations were directed to ascertaining the manner in which dips act on ticks, and in the introduction he gives the different components of arsenical dips and discusses the probable effect of each. His experiments proved conclusively that the protective action of arsenic is due to the larvae being killed and not to their being repelled. This prophylactic action is, however, of short duration; it is very noticeable for two days, but ceases after five.

The cases of arsenical poisoning which occurred in one experiment were probably due to the presence of undissolved arsenic in the dip.

816 - The Reciprocal Relationship between Husk in Sheep and in Deer. — RICHTERS, E. in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 11, Part 5, pp. 251-269. Berlin, May 5, 1913.

The writer investigated which species of strongylus are found in the lungs of sheep and of deer and how the relative embryos and sexually mature parasites differed from each other. The strongyli found in sheep were *Strongylus filaria* Rud. (*Dictyocaulus filaria*) and *Strongylus commutatus* (*Synthetocaulus commutatus*). The number of the former averaged 95 per cent., that of the latter 5 per cent. In many hundreds of lungs examined by the writer no other species were found. The sexually mature worms occurred either in the tracheae or in the bronchi, never in the lung tissue. The male of *Strongylus filaria* Rud. has an average length of 30 to 55 mm. and a breadth of 0.4 to 0.5 mm., with a long lobed pouch or bursa; its posterior appendices are three-branched, the others are double. The speculae have membranaceous wings. The females are 45 to 90 mm. in length and 0.4 to 0.6 in width; the posterior extremity is pointed, the uterus symmetrically situated in both halves of the body; the eggs containing developed embryos are of a longish oval shape provided with hyaline shell, 129 to 138  $\mu$ , long and 74 to 85  $\mu$  broad. The embryos have a dome-shaped enlargement at the anterior extremity, the tail end is short; length of the embryos from 267 to 360  $\mu$ , width 14.8 to 18.5  $\mu$ . Both males and females possess an oesophagus with bell-shaped mouth piece; the mouth is naked and the skin is ribbed longitudinally.

As for *Strongylus commutatus*, the writer states it to be a species by itself. Contrary to hitherto accepted opinions, however, *Strongylus capillaris* (*Synthetocaulus capillaris*) and *Strongylus rufescens* (*Synthetocaulus rufescens*), which have been found in sheep, appear to be identical.

The lungworms found in deer are exclusively *Strongylus micrurus* Mehlis (*Dictyocaulus viviparus*). Neither *Strongylus filaria* Rud. nor *Strongylus sagittatus* or any other species has been found in the hundred cases investigated. The writer describes *Strongylus micrurus* Mehlis as follows: Skin without longitudinal ribbing, mouth with chitin ring, oesophagus long and slender. Length: male 35 to 32 mm., female 40 to 77 mm.; breadth 0.4 to 0.6 mm. The male has a small closed bursa. The posterior appendices are three-branched, the anterior ones double and the middle ones simple. The ends of all the appendices are clubshaped, and the spiculae have no membrane wings. The heads of the embryos in the uterus are without a hood; the embryos living free in the bronchial mucus are provided with caudal appendix and pointed end. The length of the embryos is 240 to 320  $\mu$ , their breadth 15 to 19  $\mu$ .

It thus appears from the researches of the writer that the lungworms of the sheep are distinctly different from those of the deer. He considers the transmission of strongylosis from sheep to deer as unlikely.

817 — **Investigations on the Toxin of Ascarids.** — WEINBERG, U. and JULIEN, A. in *Hygiène de la Viande et du Lait*, Year 7, No. 5, pp. 225-244. Paris, May 10, 1913.

After careful investigations of the perienteric secretion of the ascarids, sclerostomae and taenia found in the intestine of the horse, the authors have come to the following conclusions:

1. — That the perienteric secretion of *Ascaris megalocephala* acts injuriously not only upon animals submitted to experiment in the laboratory, but also upon horses. The above ascarids' secretion contains a toxin.

2. — If this secretion be dropped into the eyes of a horse, the secretion causes, in two thirds of the cases, a local reaction: swelling of the eyelids, inflammation of the conjunctiva, and running of the eyes.

3. — In severe cases the local reaction is accompanied by dyspnoea, diarrhoea and perspiration.

4. — In the course of 12 to 24 hours the inflammation of the eyes disappears; generally its intensity diminishes 2 to 3 hours after the introduction of the liquid into the eye.

5. — The effect of the toxin is various. Some worms have strong toxins and others weak ones; in all cases their presence can be proved even in dilutions of 1:5000 by their action on the eyes of horses.

6. — The perienteric secretion owes its virulence not to one substance only but to several; according to Flury's investigations its poisonous nature is due to aldehydes, fatty acids and their esters.

7. — The toxin is very resistant to heat; it passes through Chamberland filters and dissolves partially in alcohol and ether. Its volatile components are also toxins.

8. — The blood of horses affected by ascarids contains antitoxins which neutralize weak solutions of ascarid toxin. If the secretion be dropped into the eyes of such horses generally no reaction takes place.

9. — Among the other parasites found in the intestines of horses only the sclerostomae produce a poisonous secretion; dropped into the eyes of horses this produces only a slight inflammation.

- 818 - *Nuttallia* and *Piroplasma* causing Piroplasmosis of Equidae in Transcaucasia. — DSCHUNKOWSKY, E. and LUHS, T. (Cattle Pest Serum Station, Sur-nobat) in *Parasitology*, Vol. 5, No. 4, pp. 289-306. Cambridge, January 1913.

The writers give in this paper a description of all the cases of piroplasmosis which they have observed in the Equidae, and establish in agreement with the most recent opinions on the subject, the presence of several kinds of piroplasmosis in Transcaucasia. The article is accompanied by two plates, which give different stages of the parasites: *Nuttallia equi* (Laveran), *Piroplasma caballi* (Nuttall), the mule *Nuttallia* and *Nuttallia asini* (Dschunkowsky et Luhs); a bibliography of 37 works is appended.

- 819 - *Salvarsan in the Treatment of Surra in Horses, Dogs and Rabbits*. — HOLMES, J. D. E. in *Memoirs of the Department of Agriculture in India, Veterinary Series*, Vol. I, No. 2, pp. 88-148. Calcutta, January 1913.

These investigations were carried out at the Pusa Experiment Station. The memoir consists of three parts, which deal with the treatment of surra in horses, rabbits and dogs respectively. In each case mention is made of previous experiments made with arsenious oxide, atoxyl, soamin, arsacetin, orpiment and potassium antimony tartrate. The results of intravenous, subcutaneous and intramuscular injections of salvarsan in various amounts are described. They brought about a disappearance of the trypanosomes for long periods, but the treatment with salvarsan is not to be recommended in the case of horses or dogs.

- 820 - *Persistence of the Virus of Hydrophobia in the Ground and exposed to the Air, and Resistance to Cold*. — KONRADT in *Zentralblatt für Bakteriologie und Infektions-Krankheiten*, Vol. 68, Part 5-6, pp. 483-493. Jena, April 16, 1913.

The writer placed some rabbits which had died of rabies in different temperatures and at different depths in the ground, as well as on the surface and in places where they would decompose naturally, and after some time had elapsed made inoculations with the spinal marrow of these animals. The results were as follows: The virus remains active in dry, black, loam soil at a depth of 3 ft. for five weeks, on the surface between + 2° C. and + 16° C. for three months, between + 16° C. and + 25° C. for 67 days, between + 7° C. and - 17° C. for 78 days and between 0° C. and + 8° C. for two months. Decomposition of the rabbits seemed to weaken the power of the virus.

- 821 - *Tuberculous Poultry the Cause of Tuberculosis in Pigs*. — BANG, OLUF in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 5, pp. 215-223. Berlin, May 5, 1913.

The writer deals with some special cases of spontaneous tuberculosis in pigs, which occurred in the last few years on Danish farms and were investigated by him. Dissection always revealed local tuberculosis of the glands of the digestive tract (tubercles the size of a hempseed in the spleen, liver, etc.) which however had no injurious effect upon the health of the animals. Fowls fed upon, or inoculated with, the substance of these glands, regularly developed tuberculosis, but guinea-pigs treated remained immune. Young pigs, on being fed on the flesh of tuberculous fowls, immediately became them-

selves affected by the disease. The writer considers that, in the above mentioned cases, the tuberculosis was due to the presence of the bacilli of avian tuberculosis, and believes, from the results of experiments, that by inoculating a living pig with fowl tuberculin it can be determined whether the animal is suffering from the avian or mammalian form of the disease. The writer attributes about 10 per cent. of the cases of tuberculosis in Denmark to the agency of the bacilli of the avian type.

822 - **Avian Tuberculosis.** — HASTINGS, E. G. and HALPIN, J. G. in *The University of Wisconsin Agricultural Experiment Station, Bulletin No 28*, pp. 249-271. Madison, March 1913.

Avian tuberculosis has been prevalent in Europe for many years, but has usually been considered a relatively rare disease in America.

Since 1906 though a considerable number of avian tissues showing the presence of tuberculosis have been sent to the Wisconsin Station. After touching briefly upon the distribution of the disease and mentioning the bibliography on the subject, the writers deal with its characteristics, the way in which birds are infected, the spread of tuberculosis amongst hens and its transmission from flock to flock. The writers give an account of their studies of the avian tubercle bacillus, of their experiments in the infection of other animals, and of their researches concerning the relation of this disease to swine tuberculosis. They also discuss the identity of avian and mammalian tubercle bacilli and the significance of avian tuberculosis in connection with the hygiene of man.

823 - **The Anatomy of *Argas persicus*.** ROBINSON, L. E., and DAVIDSON, I. in *Parasitology*, Vol. 6, No. 1, pp. 20-45 + figs. Cambridge, April 17, 1913.

The writers treat of the subject with much detail and the text is elucidated by numerous good illustrations.

824 - **Researches into the Amount of Manganese Present in the Bodies of Animals.** — BERTRAND and MADIORECEANU in *Annales de l'Institut Pasteur*, Vol. 27; Year 27, No. 4, pp. 282-288. Paris, April 25, 1913.

ANATOMY AND  
PHYSIOLOGY

The writers made a chemical examination of 40 animals of different species, and were in every case able to isolate manganese, though the amount present was much less than in the case of plants. Among vertebrates, the mammals had the least manganese (only a few hundredths of a mg. per 100 gr. of live weight). Birds, fish, frogs and reptiles had from five to ten times as much. Molluscs, which are the richest invertebrates in manganese, contain a few mg. per 100 gr.

825 - **The Effect of Intestinal Poisons (Paraeresol and Indol) on the Central Nervous Systems of Animals.** — WŁADYCZKO, S. in *Annales de l'Institut Pasteur*, Year 27, Vol. 27, No. 4, pp. 336-340. Paris, April 25, 1913.

Owing to a suggestion made by Prof. Metchnikoff, the writer attempted to ascertain the effect of paraeresol and indol upon the central nervous system of animals. Every other day for 7 days first 1 cc., and later, 2 cc., of 2 per cent. paraeresol were introduced into the stomachs of 10 rabbits and 18 guinea-pigs. At the same time, 12 rabbits received first 1 cc. and afterwards 2 cc. of 2 per cent. indol (in olive oil) every other day for 63

days, also introduced into their stomachs. At the end of the experiment the surviving animals were killed, the nervous system was carefully examined and compared with that of control animals. The results were as follows: All the rabbits which had been treated with paracresol and with indol showed a certain degeneration of the blood vessels of the brain and injury to the nervous plexus of that organ, though sometimes the effects were not well defined and the injury to the plexus was in proportion to the degeneration of the blood vessels. In the spinal marrow, the blood vessels were only affected in  $\frac{2}{3}$  of the rabbits examined. Paracresol appears to have had no injurious effect upon the central nervous system of the guinea-pigs.

FEEDS AND  
FEEDING

826 - The Employment of Whole Milk and of Corrected Skimmed Milk in the Rearing of Calves and Pigs. — (From the Zootechnic Institute of the Royal Veterinary College of Budapest). WELLMANN, OSCAR in *Kiserlatugyi Közlemények*, Vol. XVI, Part. 2, pp. 118-240 + 27 tables. Budapest, March-April 1913.

The writer, who is Professor of zootechnics at the Veterinary College, has made a series of 22 experiments lasting 213 days on a calf and 9 young pigs fed on whole milk and corrected skimmed milk. He investigated the digestibility of these substances, their transformation into albumen, and their value as sources of energy.

The correction of the skimmed milk was effected by the addition of wheat and rye flour, or else of flour starch sweetened with "diafarine". Homogenized milk, in which a preparation of beef suet called "first gravy" was used as substitute for fatty matters, was also fed. Not having a respiratory chamber the writer controlled the fat and meat production of the animals resulting from the transformation of albumen and of energy by analysing the flesh of the animals slaughtered at the end of the experiments. But as this method proved incomplete, two control animals, belonging to the same litter as the subjects of the experiment, were killed at the beginning of the experiments and their organs analysed; the same was done to three of the experiment animals after the experiment.

The summary of the results obtained was as follows:

Skimmed milk to which sweetened flour starch had been added produced scouring, and even catarrh, after being fed for some time to the calf. In the case of the young pigs, on the contrary, this milk had a favourable effect in that it perceptibly increased the appetite of the animals. Homogenized milk was taken readily by the pigs, though sometimes it caused scour. This trouble was however, easily overcome by the addition of a small amount of citric acid solution. The young pigs digested the corrected skimmed milk very well, as well indeed as the sweetened starch. They consumed daily (when from 4 to 14 weeks old) with the milk, which they were fed *ad lib.*, per 1000 lbs. live weight, 30 to 47 lbs. of dry matter, 7 to 12.5 lbs. of digestible protein, 0.7 to 2.4 lbs. of digestible fat, 1.6 to 2.2 lbs. of digestible ash, which is equivalent to 34 to 44 lbs. of starch value, or 73 000 to 90 000 digestible calories.

The average daily increase was 2.2 to 3.1 lbs. per 100 lbs. live weight.

The increase in live weight decreased progressively as the animals grew older. An increase in live weight of 1 lb. necessitated a ration of 1.2 to 1.8 lbs. of dry matter in the milk, 0.26 to 0.49 lb. of digestible protein, that is 1.1 to 1.9 lb. of starch value, or 2 300 to 4 100 digestible calories, which are equivalent to 7.3 to 10.8 lbs. of milk.

Of the different kinds of milk, skimmed milk corrected with sweetened flour starch was the least expensive form of food.

For a certain increase in weight, the youngest pigs required less food than older animals. The young pigs, during the experiment, assimilated from 36 to 74 per cent. of the digestible protein. The age of the pigs, together with the nutritive property of each kind of milk, influenced in a marked degree the digestion of protein. The younger the pigs, and the more nutritive the milk, the greater was the proportion of protein digested. The subjects of the experiment decomposed 2.6 to 6.1 lbs. of protein per 1000 lbs. live weight.

The physiological utilization of the different kinds of milk varied from 84 to 90 per cent. The young pigs used from 2250 to 3150 calories to gain 1 lb. in weight.

Rearing animals on skimmed milk corrected with flour and sweetened starch, and on homogenized milk, were the least expensive methods, and cost from half to two-thirds as much as the employment of whole milk.

Analysis has shown that the flesh of younger animals contains less nitrogen and dry matter free from fat, than that of older individuals. The analyses of the young pigs furnished data respecting the repartition of different substances and of chemical energy between the different organs. They further showed that Mangalica pigs produce more fat, while Berkshires produce more lean meat; this difference manifests itself very clearly from quite an early age.

827 - **The Nutritive Value of Maize Cob Meal.** — TANG and WEISER in *Die landwirtschaftlichen Versuchsstationen*, Vol. 81, Part 1-2, pp. 35-47. Berlin, 1913.

An account of digestibility experiments made by the writers with sheep; the ration was a mixture of crushed maize corn (75 per cent.) and crushed maize cobs (25 per cent.). The investigations showed that coarsely and finely ground mixtures of crushed maize corn and cobs were equally digestible, but not as digestible as maize corn.

828 - **Why Inbreeding Decreases Fertility.** — WENTWORTH, E. N. in *The Breeder's Gazette*, Vol. LXIII, No. 20, p. 1154. Chicago, May 14, 1913.

BREEDING

From the days of the earliest practice of inbreeding there seems to have been a definite idea that it caused degeneration of the stock, evidence of which was supposed to be shown in decreased size, vigour, longevity and fertility.

An experiment on this subject was started through an accident by which mice destroyed the cultures of fruit flies that the writer used for hereditary demonstration purposes in his laboratory work. From the wreckage three pupae were saved that gave a living pair of flies to start with. On mating, they produced 126 offspring.

In a previous article, the writer has spoken of the importance of the law of segregation on the tendency of characters present in preceding generations to separate out in certain individuals.

The offspring of the flies were divided into four strains, one high in fecundity, one low, and two medium. The interesting thing is that the high and low strains breed true, while the middle strains show in many individuals the segregating out of other types. Several hundred individuals were bred, but the table shows only the average production for each line.

Four pairs of flies from the 126 in the first generation, when inbred, gave the following number of offspring.

	High Line	Low Line	Two Medium Lines
3rd generation . . . . .	128.7	35.9	78.9
4th " . . . . .	134.6	30.1	81.2
5th " . . . . .	132.2	29.7	83.7
6th " . . . . .	135.6	32.7	68.1
7th " . . . . .	133.4	28.7	60.1
8th " . . . . .	140.1	29.4	71.3
9th " . . . . .	138.0	25.7	69.1
10th " . . . . .	141.3	24.6	66.3
Average . . . . .	135.9	29.5	72.1

This shows the absolute distinctness of the three groups. When all the groups are added together and the averages taken, each generation after the fifth shows a decrease, similar to the experience of the practical breeder. The third generation equals 80.6; the fourth 81.8; fifth 109.8; sixth 101.5; seventh 98.1; eighth 78.0; ninth 75.5 and tenth 74.6.

The rapid lowering of the averages in the last five generations would be interpreted by the breeder, who thinks only in terms of averages, as excellent proof of the injurious effect of inbreeding. We, however, see that the inbreeding was not at fault, for in the last generation the segregated high line gave its highest production, *viz.* 141.3 individuals. Only one lesson can be drawn from this, *viz.* that the breeder must study his animals individually. Those men who have succeeded by inbreeding have done so by their capacity for careful selection, while those who have failed simply waited for good characters to appear of their own accord.

‡ Inbreeding does not cause degeneration; it only allows weaknesses to appear; and it also brings out the good points, so that the breeder need only select the most suitable animals for further breeding operations.

The distribution of the groups would indicate a simple pair of factors and a 1 : 2 : 1 ratio, as considered in Mendelian inheritance. This is only apparent, however, and more study is needed to completely elucidate the factors.

- 829 - **Maternal Inheritance and Mendelism.** - TOYAMA, K. (Zoological Institute, College of Agriculture, Tokyo Imperial University) in *Journal of Genetics*, Vol. 2, No. 4, pp. 351-405. London, February 1913.

The writer describes in this paper the results of experiments made by him during the last five years on the hereditary transmission of certain characteristics of form and colour in silkworms' eggs.

The different variations from the normal form and colour are given in a coloured plate.

The writer deals briefly with the origin of these deviations and gives the results of line breeding certain variants for some generations and of crossing breeds or variants possessing different egg-characteristics.

Numerous genealogical tables are given and the most important results are summarized in two chapters devoted respectively to general considerations and conclusions. A brief bibliographical notice of 13 publications is appended.

- 830 - **The Thirty-Seventh Fat Cattle Show in Berlin.** - AUGUSTIN and MEYER in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 19, pp. 217-221. Hanover, May 9, 1913.

The writer draws attention to the importance of fat cattle shows from the point of view of meat production, and then gives some information as to which districts took part in the last show and which breeds took most prizes. Illustrations are given showing many of the exhibits.

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- 831 - **The Show of Stud Animals at Algiers.** - MANTOUT, SUISSE, CAUSSE, VERMEIL and CARD ONNE in *Revue Agricole et Vétérinaire de l'Afrique du Nord*, No. 59-60, pp. 390-409. Algiers, April-May 1913.

The writers mention the improvements in Algerian stock-breeding which they observed on the occasion of the last Show. Pictures are given of the different typical stud animals, and suggestions brought forward as to the means of promoting stock-breeding and increasing the number of head.

- 832 - **Horses Imported into the United States in 1912 for Breeding Purposes.** - Animals imported for Breeding Purposes, 1912, Horses. - U. S. Department of Agriculture, Bureau of Animal Industry. Washington, April 1913.

HORSES,  
ASSES AND  
MULES

In 1912 a total of 3467 horses was imported under the new regulations into the United States for breeding purposes (Bureau of Animal Industry, Order 186 (1)). In the above-mentioned publication of the U. S. Department of Agriculture are given the sex, breed, name and studbook number, the importer, port of importation and the date of the arrival of each animal.

The following table gives a summary :

Breed	Stallions	Brood Mares	Stallions and Mares (*)
Belgian . . . . .	609	347	956
Clydesdale. . . . .	33	57	90
Boulonnais (French Draft) . . .	9	—	9
Hackney . . . . .	14	12	26
Percheron . . . . .	1104	859	1963
Shetland Pony . . . . .	4	27	31
Shire . . . . .	156	91	247
Standard Breed . . . . .	1	2	3
Suffolk . . . . .	10	15	25
English Thoroughbred . . . . .	4	8	12
Welsh Pony . . . . .	13	92	105
Total . . .	1957	1510	3467

(\*) Some of these horses were imported in 1911 and are reckoned in here because the importation formalities were not concluded until after January 1, 1912.

833 - **The Breeds of Horses in Rumania.** — FITZ in *La Vie agricole et rurale*, Year 2, No. 21, pp. 608-613. Paris, April 26, 1913.

In 1900 there were in Rumania 864 746 horses ; of these, 584 194 belonged to the Walachian, 193 062 to the Moldau and 87 490 to the Dobrudja breeds. The districts richest in horses are Jalonitza, Ilfov, Dolj, Constantza. Breeds : Moldau, Mountain, Jalonitza and Dobrudja. The last includes four types, of which two (the true Dobrudja and the Russo-Bessarabian types) are fairly widespread. This article contains a description of these breeds and the text is elucidated by illustrations.

834 - **Horse Breeding in German South-West Africa.** — WINKLER in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 40, pp. 373-374. Berlin, May 17, 1913.

Notes on the development and present condition of horse breeding (pictures of typical stud animals being given), the best breeding districts and the natural conditions of horse keeping, together with an account of the Imperial Government Stud at Nauchas and its influence on breeding throughout the country and upon the supply of remounts. Suggestions with regard to breeding.

835 - **The Relation Between Live-Weight and Performance in Cows.** — PETERS, I. in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 21, pp. 252-253. Hannover, May 23, 1913.

CATTLE

The writer has made some investigations, based on the data of the Dutch Herdbook Association, as to whether heavy or light cows turn their feed to better account. The data for 1911 are given in the two following tables, in which the animals are grouped according to their weight. The figures in Table I-A refer to herdbook cows, while those in Table I-B refer to cows which are not registered. All the cows were five years old.

TABLE I - A.

Weight Group	No. of Cows	Average weight		Milk yield	Milk-fat yield		Increase in live-weight	Units of (1) performance	Starch value used	Performance units per 100 kg. (220 lbs) starch value
		lbs.	lbs.		%	lbs.	lbs.		lbs.	
Under 1 100 lbs.	67	1 056.0	7 101.6	3.26	231.6	59.4	113.6	3 823.6		6.54
1 100-1 208 "	263	1 161.6	7 403.0	3.22	238.0	77.0	119.9	3 854.4		6.84
1 210-1 318 "	464	1 265.0	7 799.0	3.24	252.3	59.4	123.4	3 949.4		6.89
1 320-1 428 "	304	1 368.4	8 109.2	3.22	261.1	55.0	126.3	3 957.8		7.02
over 1 428 "	128	1 482.8	7 856.2	3.21	252.1	37.4	120.1	3 938.0		6.71
Aver. of all groups	1 226	1 280.4	7 727.2	3.23	250.4	59.4	122.5	3 920.4		6.87

TABLE I - B.

Under 1 100 lbs.	84	1 031.8	6 331.6	3.21	203.1	59.4	101.2	3 592.6		6.20
1 100-1 208 "	216	1 157.2	6 892.6	3.19	220.0	83.6	112.5	3 746.6		6.61
1 210-1 318 "	237	1 258.4	7 453.6	3.17	236.7	77.0	118.8	3 999.6		6.54
1 320-1 428 "	143	1 366.2	7 821.0	3.20	250.1	68.2	123.8	4 142.6		6.57
over 1 428 "	32	1 478.4	7 312.8	3.20	234.3	70.4	117.2	3 832.4		6.73
Aver. of all groups	712	1 234.2	7 218.2	3.19	230.1	74.8	115.8	3 896.2		6.54

(1) By unit of performance the writer understands 2.204 lbs. of milk fat, or 6.612 lbs. of body weight substance. (Ed.).

From this summary, it is clear that light cows, on the average, are inferior performers. The larger milk yield of the herdbook cows as compared with the unregistered animals is attributed by Mr. Peters to the better constitution and resistance powers of the former.

836 - **Studies in Dairy Production.** — WOLL, F. W. in *The University of Wisconsin Agricultural Experiment Station, Research Bulletin*, No. 26, pp. 55-135. Madison, October 1912.

These studies are based on the records secured at the Wisconsin Dairy Cow Competitions in 1909-1911. The writer gives the methods adopted for calculating the value of the food consumed and of the milk produced (distinguishing between the value of the butter and that of the skimmed milk) and analyses the results from different points of view. The cows used for the experiment were Holsteins, Guernseys and Jerseys.

837 - **The Wool Industry in the British Dominions.** — BEAN, C. E. W. in *Journal of the Royal Society of Arts*, Vol. LXI, No. 3143, pp. 327-345. London, February 14, 1913.

A century ago, Spain was the only country which exported wool to England, for the Spaniards had developed a most valuable, white-woolled breed known as the "travelling sheep" — the Merino. The primitive ancestral sheep, the black Montanches, still exists in Spain and from this the famous breed was evolved by selection of white-woolled specimens. The Spanish Merino was and is very hardy, picking up a living amongst the dry uplands during part of the year and then travelling along the cañadas or stock routes, to better feed elsewhere.

In 1802, of the 8 000 000 lbs. of wool which England imported from abroad, over 6 000 000 lbs were obtained from the Spanish Merino sheep. Yet this was the time of the Peninsular War, which must have interfered considerably with this commerce, and moreover Parliament had put a duty on imported wool. In 1803 a deputation of English wool manufacturers who had been sent up to London, were informed of the existence of a breed of Spanish sheep in the colony of New South Wales. The proprietor of the flock was a young officer of the 102nd regiment, stationed at Sydney, but at that time in London with samples of his wool. In spite of the scepticism of many persons in Australia and elsewhere, he succeeded in convincing the deputation of the future of sheep-breeding in the Colony.

At the beginning of last century, Spain exported rather over 6 000 000 lbs. a year to England; in 1911 Australia sent 314 517 052 lbs. to England, and New Zealand, which was uncolonized in 1803, sent 189 680 851 lbs., while Spain has long ceased to send any at all.

The duty imposed in 1802 applied to all imported wool, colonial or foreign, but in 1825 the duty was taken off colonial supplies. For 19 years the latter enjoyed preference, which resulted in a large increase in the colonial imports, but with the establishment of free trade the foreign imports became larger. Colonial wools, however, more than kept their lead, and at present control the wool markets of the world.

According to statistics, the whole world contains at the present time about 615 000 000 sheep. Of these nearly 93 000 000 are in Australia, 24 000 000 are in New Zealand and 22 000 000 woolled sheep are in South Africa. Thus these three new British States, which possessed hardly any flocks a hundred years ago, now have nearly 140 000 000 sheep. If to these are added the flocks of Canada, the Falkland Islands and the British Isles, the total for these countries amounts to nearly 180 000 000 head. This excludes the sheep of British India, some of which are woolled, and the unwoolled breeds of S. Africa, yet it amounts to nearly a third of the world's sheep in numbers and very much more than that in value.

The importance of British dominions in the world's wool trade is shown in the following table :

1910

*British Empire.*

Australia . . . . .	708 644 403 lbs.
New Zealand . . . . .	204 368 957 "
British South Africa . . . . .	139 488 573 "
British India . . . . .	54 458 894 "
United Kingdom . . . . .	38 185 983 "

*Foreign Countries.*

Algeria . . . . .	22 124 480 lbs.
Argentina . . . . .	332 010 555 "
Belgium . . . . .	241 457 748 "
Chile . . . . .	27 749 867 "
China . . . . .	31 091 867 "
France . . . . .	82 685 948 "
Netherlands . . . . .	20 836 188 "
Peru . . . . .	8 375 328 "
Russia . . . . .	20 826 252 "
Spain . . . . .	23 935 503 "
Turkey . . . . .	40 156 583 "
Uruguay . . . . .	92 782 796 "
Others . . . . .	100 171 000 "

Total . . . 2 189 350 925 lbs.

The way in which the Merino flocks were established in the British settlements overseas was somewhat romantic. The Spanish Government retained for some time the monopoly of Merino sheep, and the sending of these animals outside of the kingdom was attended with severe penalties. But between 1765 and 1809 on several occasions exceptions were made as a compliment to a neighbouring king or government. In 1765 the Elector of Saxony was presented with a flock, and in 1775 some animals from the Spanish flock of Count Negretti were given to the Austrians. The Saxon flock was established at Lohmen and gradually bred to an exquisite fineness of wool. The Austrians placed theirs at Hostitz and bred for strong barrel-like bodies. Other sheep sent to France were tended at the farm at Rambouillet and bred for large frames and long wool.

Others again sent to Holland were partly reexported to the Cape of Good Hope. In 1787 and 1791 a few Merinos were presented to King George of England and kept on the Royal farm at Kew. Finally, a few head sent to America in 1890 and stationed at Vermont were developed to produce a huge expanse of wrinkled skin so as to increase their fleece.

Captain John Macarthur, the young officer from Sydney, had thirty sheep of a Bengal breed sent from Calcutta. They were skinny, long-legged, razor-backed animals absolutely deprived of wool, but he believed that by crossing them with Merinos he would eventually obtain a flock with valuable fleeces, and with some difficulty bought three rams and five ewes from Colonel Gordon's widow, who was parting with her Dutch Merino flock. Colonel Gordon had belonged to the Dutch East India Company and in his charge the Dutch Government had sent a small flock of Merinos to the Cape.

With the Merinos he had bought and the Bengal sheep, Macarthur laid the foundation of Australia's flocks at Elizabeth Farm. He first improved his sheep by crossing the Bengal ewes with some Irish rams he had obtained, and then crossed the product with the Merinos again and again till he obtained wool of excellent quality and fleeces weighing on an average 5 lbs.

In 1801 he came to England, and in spite of the opposition of Sir Joseph Banks, received a concession of 10 000 acres of land and was allotted some convicts as shepherds. He then bought seven rams and one ewe from King George's Merino flock at Kew, which was, however, not in very good condition. Returning to Australia, Macarthur took up his great task and within eighteen years — in 1822 — he was presented by the Duke of Sussex with two gold medals "for importing into England wool..... equal to the finest Saxony". It should be mentioned that the first Saxon sheep are said to have been exported into Australia only in 1825 or 1826, but soon afterwards great numbers of these animals were imported into Tasmania and some magnificent flocks were established there, while Victoria was colonized from Tasmania. Since then the Rambouillet and Vermont flocks have also had their influence. In order to meet the demand for mutton, some of the Australian owners began to cross their sheep with large English Southdowns, but later fineness of wool became the only object of the sheep-breeder. In 1912, the average weight of the fleece of Australian sheep, including lambs, was 7  $\frac{1}{2}$  lbs., while individual fleeces have run to as much as 40 lbs.

The South African sheep had much the same history, the fat-tailed Cape sheep with the whitest hair being crossed repeatedly with Merino rams. Here, curious cases of atavism occur even now. The modern breed has been founded on Australian stud sheep, some of the rams costing as much as £1000.

Australia's success in the breeding of fine-woolled sheep has been ultimately due to the fact that they can be raised there with practically no attention throughout the year, and with but little other expense than the hire of a few shepherds. In order to protect the sheep from the dingo (a wild dog) and reduce the number of shepherds, the runs are enclosed with a fence of wire netting. Feeding in the sense understood by the English farmer is unknown and the animals graze on the natural pastures except in seasons of exceptional drought. In South Africa, sheep live very much as on the Central Australian runs, except that in the waterless parts they have regularly to be withdrawn during a part of the year. The great difficulty has been the jackal, but the fencing of the farms is minimising the danger. In the Falkland Islands the methods very closely resemble those of Australia, and the sheep-farming industry in Patagonia was originally started by the Falklanders and is still fed by emigration from those islands.

The first stage of British dominions and colonies has generally been a pastoral stage. The land, or most of it, usually belongs to the Government, and concessions are made of grazing rights on the payment of a small annual sum. The large tracts of land over which each man acquires grazing rights are called stations or runs in Australia and New Zealand, and sometimes also in the Falkland Islands, and ranches in Western Canada.

In time the Australian squatter, or Canadian sheep or cattle man, builds a very comfortable homestead. With the development of roads and railways and the increase of population, the best land about streams and waterholes is required by the Government for agriculture and is leased to settlers. Though this policy of the Government can scarcely be called in question, it has given rise to more or less open warfare between the pastoralist and the intruding farmer; the quarrel however usually adjusts itself and almost always in favour of the latter. But there remains a sharp distinction between the pastoralists, who occupy great expanses of country for stock, and the farmers proper. Some of the stations are of enormous size; the largest in the Falklands is 700 000 acres and supports nearly 200 000 sheep. The average size of a sheep run there is 12 000 acres with from three to five acres per sheep.

The pastoralist of Australia and New Zealand is a capitalist and usually possesses good education and credit. He studies the literature dealing with his work, and his methods of breeding and shearing are the most perfect in the world and produce excellent wool. Certain stud farms in Victoria and Tasmania, *e. g.* Wanganella, Boonooke and Uardry, have become famous for the quality of their wool.

Shearing is done by machine shears and is effected between May and December by professional shearers, who visit the different stations. The fleeces are classified and sorted before leaving the shearing-shed by experienced and conscientious persons, the wool of a station being sometimes classified into at least fifty descriptions, and the classifier may be paid as much as £10 per week. In this way the highest prices can be obtained for the wool.

Formerly such South African wool as arrived in London was miserably packed and got up and realized lower prices than Australian wool. Shearing was (and still is) done by hand twice a year, and the trade was in the hands of small dealers. But of late years great progress has been made in classing and packing the wool, as well as in the trading methods. The industry has also developed satisfactorily in the Falklands.

The wool sales in Australasia are remarkably well organised, being quite independent of the intervention of middlemen. Formerly the chief sales were held in London at the Wool Exchange in Coleman Street; but nowadays the greater part take place in Australia and New Zealand, while the big London market deals with supplies from the Cape, the Falkland Islands and other parts.

Owing to the transport, the average prices on the London market are higher than those on the Australian markets, which are patronised by the Germans (who buy heavily at Sydney), the French, the Belgians, the Dutch etc. The Australian squatter has from the first been able to sell his wool on his own account in London on account of the great facilities for local credit which he has always possessed.

In the last century, the great sheep runs and stations of the British Empire overseas were the most important sources of the wool supply, but it is very doubtful if they will continue to be so in the future, for two great changes are affecting firstly the class of wool from oversea and secondly

the class of grower by whom that wool is produced. The Governments are cutting up large areas of stations and establishing farms in their place. It is from these farms that the wool of the future must come, and therefore the basis upon which the sheep-rearing industry has been established will be different.

After the discovery of the possibility of transporting frozen meat by sea, which revolutionized the food supply of England and greatly increased the wealth of Australasia, the colorists began to cross Merino ewes with rams of the long-woolled early-maturing breeds: Romney Marsh in New Zealand; Leicester, Border Leicester and Romney Marsh in Australia; Lincoln and Romney Marsh in the Argentine. In order to obtain better mutton and a quick-maturing lamb, crosses, or especially second crosses, were made with short-woolled English sheep: Shropshires, etc.

Thus the class of oversea wool is changing; already more than a quarter of the wool from Australasia is cross-bred, and the proportion is continually increasing. Crossing has been practised most in New Zealand and Argentina, and least in Australia and South Africa. Cross-breeding in Australia and New Zealand consists at present in keeping pure-bred Merino ewes and pure British rams, and breeding one or two crosses from them. As an exception to this rule must be mentioned the fact that in New Zealand Merino ewes have been crossed with Lincoln rams and the half-bred offspring in-bred, until the so-called Corriedale sheep has been produced.

The replacing of the big stations by closer settlements has reduced the standard of breeding; the farmer cannot afford to pay exorbitant prices for his rams as can the pastoralist (1), neither can he concentrate all his attention on his flock. Nevertheless the local Governments, especially in South Africa, are making great efforts to educate the farmers up to the excellent methods now employed on the big stations, while the system of co-operation, which is gaining ground in Queensland, may also help to maintain and render more secure the returns of the sheep industry.

Lastly, while the pastoral age of sheep-farming is probably destined to pass away altogether in New Zealand and Canada, it will never disappear from vast tracts of Australia and South Africa where the dry climate and poor soil make the general conditions unsuitable for agriculture.

It appears probable that a large supply of fine Merino wool will always come from the large holdings of Australia and South Africa, though increasing quantities will be produced by the cross-breds on the farms. The demand for wool is increasing in Europe, and is expected to increase shortly in America. It is growing fast in Japan, and the demand from China, if it comes into existence, is a factor hardly to be realized. The killing of sheep for freezing tends more and more to keep the numbers down and, except within the British Empire, the world's flocks seem to be decreasing. Everything points to a prosperous future for the wool industry, to the special advantage of the British Dominions in which it holds such an important place.

(1) £1600 was paid for the ram "President" in 1896, £1500 for "Admiral" in 1899, and £1500 for "Dandie Dinmont" in 1904. (Ed.).

838 - Experiments with Pigs. — CLARK, R. W. *Montana Agricultural College Experiment Station, Bulletin No. 89*, pp. 16. Bozeman, Montana, June 1913.

PIGS

At the end of this Bulletin, the writer gives the results of eight pig-feeding experiments with different proportions of various feeds: shorts, barley, frosted wheat, lucerne, sugar beets, blood meal, skimmed milk, etc. Other experiments were made in order to determine the most suitable rations for brood sows. Mr. Clark also deals with the returns from feeding five brood sows and their litters for one year.

839 - Further Report on Egg-laying Competitions in the Rhineland. — BOSCH, R. in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*, Year 14, No 18, pp. 310-314 No. 19, pp. 327-330 Bonn, May 2 and 9, 1913.

POULTRY

The Chamber of Agriculture for the Rhineland has during the last three years conducted egg-laying competitions for poultry lasting ten months in each year, from November to August, at its special grounds. The results of the first two years' work are given in the present report. The first year 210 one-year-old hens were tested and in the second year 210 two-year-old hens; with few exceptions in both competitions the same birds were used. Each of the six breeds examined were represented by seven families, each consisting of five members.

The comparison between the total yield of the one-year-old birds and that of the two-year-olds is considerably in favour of the former. During the ten months that the competition lasted the one-year-old hens laid 125 eggs (worth 11s 3¼d), the two-year-olds 102.4 eggs (worth 8s 7¼d). The eggs laid in winter by the latter were only 37.1 per cent. of those laid by the former.

The following are the scores of the various breeds :

Breed	Average number of eggs laid	
	One-year-old hens	Two-year-old hens
Black Rhenish . . . . .	104.7	124.1
White Wyandotte . . . . .	130.7	99.3
Black Minorca . . . . .	126.5	99.6
Partridge Italian . . . . .	121.0	103.7
Buff Orpington . . . . .	119.8	92.1
White Orpington . . . . .	111.3	95.5

The small breeds have thus proved more productive than the medium-sized; nevertheless the difference was not so marked among the one-year-olds as among the others. As for their behaviour during the various periods of the competitions the small and medium breeds gave one third of the total yield during the first five months. The maximum number of eggs laid by the small breeds was in May for the one-year-olds and in April for the two-year-olds, while that of the medium-sized breeds was in both cases one month earlier.

The writer then compares the yields of the best and the worst families and finds that in both competitions the Rhenish and the Italian breeds show the most uniform results. The Minorca families showed also in the first competition considerable uniformity, but less in the second. Among the medium-sized breeds the yields of the various families were very different and this the writer attributes to the still incomplete improvement of the breeds.

Lastly, concerning the weight of the eggs, the heaviest were those of the Minorcas (2.20 oz.) and of the White Orpingtons (2.11 oz.); the lightest were the Italians (2.03 oz.) and the Rhenish (1.98 oz.). The best layers accordingly produce the lightest eggs. The eggs laid by the one-year-olds were on the average 0.08 oz. lighter than those of the two-year-olds.

The writer reports upon the money value of the eggs and gives some advice on the keeping of egg-laying poultry.

#### 840 - Irish Egg-Laying Competition, 1st October to 31st December 1912. —

MURPHY, E. in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 2, pp. 303-306. Dublin, January 1913.

During 1912 it was felt that a fresh stimulus to the industry of rearing farm poultry in Ireland was necessary; to this end the Department of Agriculture and Technical Instruction arranged that the first Irish Egg-Laying Competition should be held at the Munster Institute, Cork.

The site selected was a level strip of land, which had never been used for poultry. The soil is very suitable, being a rich loam over limestone gravel, but there is no natural shelter.

The runs are 54 in number, 52 being occupied by competition birds. Every pen of six pullets is provided with a separate house and run. The latter is sheeted with boards on all sides to a height of 3ft. The houses are well sheltered from the weather and are each provided with three trap nests. All doors open on the passage, as do the trap nests, so that untrapping, feeding, cleaning, etc., can be done without entering the runs.

The pullets arrived at the place of competition on September 13, 1912, and the contest began on October 1.

The following were the breeds entered:

Breed	No. of pens entered
White Wyandotte . . . . .	12
Barred Rock . . . . .	8
Rhode Island Red . . . . .	6
Buff Orpington . . . . .	5
White Leghorn . . . . .	5
Brown Leghorn . . . . .	4
White Orpington . . . . .	4
Red Sussex . . . . .	3
Faverolle . . . . .	3
Light Sussex . . . . .	1
Minorca . . . . .	1
Control pen (Rhode Island Red) . . . . .	1

The 54th pen is used for broody hens.

Taking into account that this was the first competition held in Ireland, and that most of the competitors were novices at selecting birds for such a contest, the quality was very fair, and though too early hatching, immaturity and bad condition were apparent in some of the exhibits, only two birds died, and the health of the birds remained good in spite of the bad weather in December. The leading pens were all in splendid condition on arrival.

The foods used were oats, maize, wheat, pollards, thirds, bran, linseed meal, meat meal, cut clover, hay, cabbage and milk. A supply of grit and shell is always available and the birds have water both inside and outside the house.

The writer gives a table showing the position of the different breeds, as regards the number of eggs laid, as well as the price obtained for the latter.

The number of eggs laid by the 10 best pens was as follows :

1. Red Sussex . . . . .	296
2. White Wyandotte . . . . .	293
3. Buff Orpington . . . . .	244
4. Rhode Island Red . . . . .	231
5. White Wyandotte . . . . .	203
6. Buff Orpington . . . . .	199
7. Rhode Island Red . . . . .	195
8. Brown Leghorn . . . . .	191
9. Rhode Island Red . . . . .	189
10. Rhode Island Red . . . . .	188

841 - **A Danish Eel Farm.** — GREEN, CHARLES in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 2, pp. 300-302. Dublin, January 1913.

FISH

On the north coast of Zealand in Denmark, just within the entrance of the Ise Fjord, there has been established since 1905 an eel fishery, which, for ingenuity and simplicity, is probably unique.

A dike had been constructed at Hov-Vig near the village of Ny-Kjööb- ing with the intention of reclaiming a portion of land for agricultural purposes. That undertaking having been found unremunerative and abandoned, Mr. Nielsen, of Copenhagen, conceived the idea of turning it into an eel-farm.

Within the embankment there are about 300 acres under water; the water is fresh and, in a great part, only two feet deep; it is supplied by the surface drainage of the surrounding land.

When taken over by Mr. Nielsen, the lake already held a small stock of eels, which had doubtless found their way in through a sluice-gate situated at about the centre of the embankment; this stock has been systematically increased by the introduction of elvers, captured as follows :

On the appearance of the eel fry in the fjord at the end of their long journey from the breeding grounds in the Atlantic Ocean, a rough crate heaped full of water-weeds is lowered into position across the front of the sluice

gate. The latter is then raised so as to allow a stream of fresh water to flow through the crate. The elvers, in search of fresh water, make their way upstream to the crate and remain entangled among the weeds, which in due course are lifted out and shaken over a piece of very fine-meshed net. This enables the proprietor to estimate the number of elvers introduced annually into the lake; the estimate is based on the weight of the elvers, of which about 1 500 go to the pound.

The capture of the mature silver eels for the market is effected by means of an apparatus designed and constructed by Mr. Nielsen. It can be worked by him single-handed, assistance only being required occasionally for heavy work. Slung from a frame-work of rough poles is a box, or chest, about twelve feet long; round the sides of it are openings about nine inches square, each provided with a small conical eel net of the ordinary shape opening internally into the box, and a row of holes which permit the circulation of the water and the escape of undersized eels. The central part of the box is carried up so as to be above water when the main part is submerged, and a hatch in the side of this vertical prolongation gives access to the interior.

On the bank is a windmill by means of which salt water from the fjord can be pumped into a channel leading at either end to a wooden shoot.

The day before a consignment of eels is to be taken, the windmill is set in operation, and a continuous stream of salt water is discharged in front of either box, in order to collect the mature eels by taking advantage of the migratory impulse involved in their condition which leads them seawards. The box is lowered into the water at nightfall by means of the geared winch at each end of the frame, and the stream of salt water is led in to the top of it by an extension of the wooden shoot. The eels are thus enticed into the box, which is subsequently hoisted for their removal. At the time of the writers' visit to Hov-Vig there were two of these boxes in use.

To control the increase of salinity in the water of the lake, due to the salt water pumped in and to evaporation, a second windmill is installed, by which fresh water can be pumped in when required from a neighbouring land-drainage canal.

The lake contains a large number of *Mysis* and apparently enough natural food to support a certain stock of eels. Mr. Nielsen, however, supplies a considerable quantity of artificial food consisting of unmarketable fish (which is minced in a machine driven by a rope-belt from the first-mentioned windmill and thrown loose into the lake); this proceeding he regards as still of an experimental character, though he believes it has a stimulating effect on the growth of the eels.

The subjoined figures show that the success of the enterprise is fairly evident. The elvers turned down in 1905 would normally begin to reach maturity in five or six years, and that a large number of them have done so is clear from the sudden increase in the yield of marketable eels in 1910 and 1911.

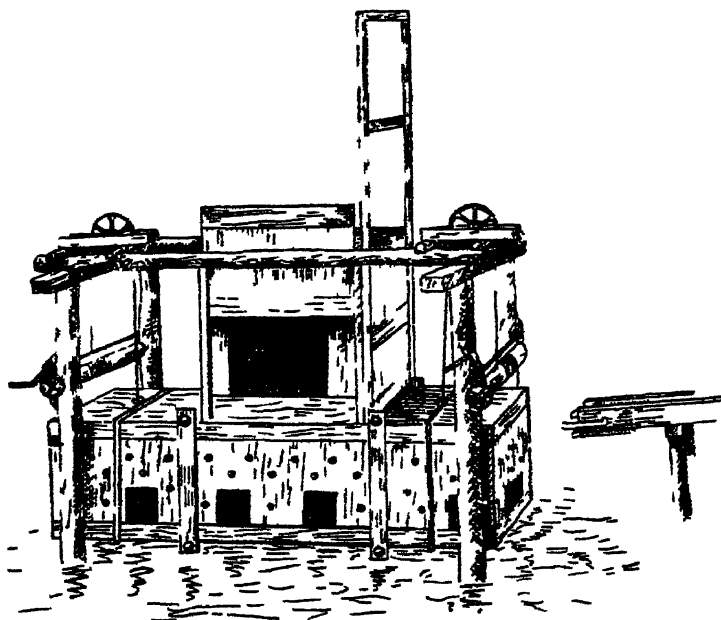


Fig. 1  
Eel-catching box raised out of the water.

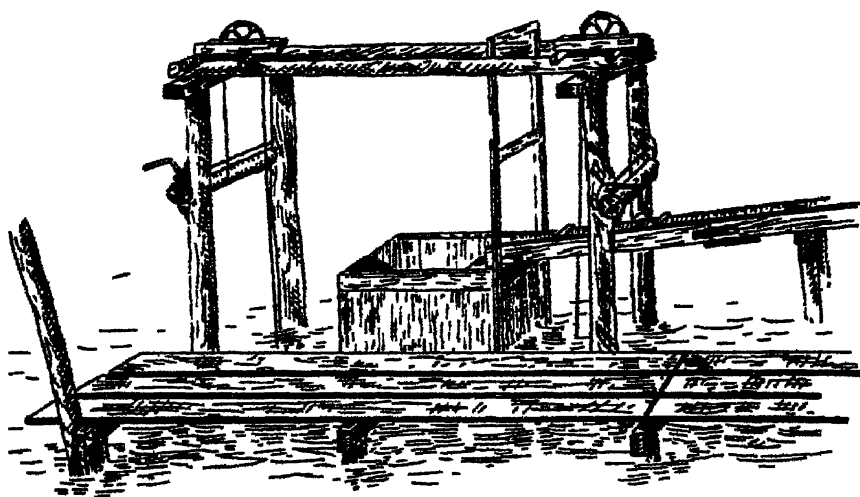


Fig. 2  
Salt water being pumped into eel-catching box



Year	Number of eiders turned down in lake	Catch of marketable eels in cwt.
1905	49 000	—
1906	60 000	27 $\frac{3}{4}$
1907	128 000	45 $\frac{1}{4}$
1908	100 000	40 $\frac{1}{4}$
1909	100 000	22
1910	60 000	78 $\frac{1}{2}$
1911	70 000	136 $\frac{3}{4}$
1912	159 000	—

### FARM ENGINEERING.

842 - **Trials of Motor Tractors in Algiers.** — VENTON-DUCLAUX in *La Vie Agricole et Rurale*, Year 2, No. 23, pp. 660-667. Paris, May 10, 1913.

AGRICULTURAL  
MACHINERY  
AND  
IMPLEMENTS

The ploughing competition, held in connection with the Show of Motors and Agricultural Machines organized by the French and Algerian Automobile Clubs at Algiers (March 22 to April 20), lasted two days. It took place in the presence of the President of the French Automobile Club and of the Governor-General, on ground about 17 miles from Algiers.

Seven firms took part in the competition: Mac Laren, Case, Avery, Lefebvre, Arion, the Stock Motor-Plough Co. Ltd., and the Franco-Hungarian Society. Seven machines in all were tested.

The writer gives in his paper a description and figures of the different tractors, and of the conditions of the trials. No classification was made of the performances.

The judging committee expressed the wish that the constructors should turn their attention to devising machines for the Algerian market, taking into consideration the special conditions and requirements obtaining in Algeria.

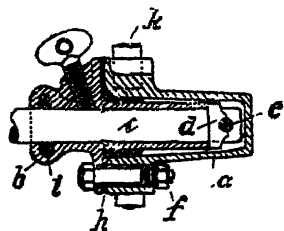
843 - **Eckert's Plough Wheel Nave.** — MARTINY in *Landwirtschaftliche Umschau*, Year 5, No. 20, pp. 459-460. Magdeburg, May 16, 1913.

The construction of the wheel naves of agricultural field machines is of the greatest importance for the lightness of draught and durability of the machine.

Formerly in the closed naves a ring was forged on the wheel axle to prevent the wheel from slipping off, but when it began to be much worn it could not be replaced by another one. The nave and the set of spokes were two separate pieces and the disks that joined them were also separate pieces, so that in taking to pieces or fitting up such a wheel a number of small parts had to be dealt with.

In the most recent model of closed naves (see fig.) this difficulty is avoided. To prevent the wheel slipping off, a loose ring (*d*) is put on the axle and kept in its place by a pin (*e*). This ring abuts immediately against

the disk (*b*) which acts also as box to the wheel. The packing which fills up the space between the axle and the disk is situated in the hollow (*i*) of the disk (*b*). Between the nave (*a*) and the disk (*b*) a cardboard disk (*h*) is placed; this acts also as an elastic body to prevent fractures. The result is simplicity in construction and in fitting.



To take it to pieces only the two bolts (*f*) have to be loosened and the set of spokes (*k*) with the nave (*a*) attached to it can be slipped off the axle. On removing the pin (*e*), the ring (*d*) and the disk (*b*) can be removed. These are no other parts. All the working parts are interchangeable, and they are

proof against the entrance of dust.

The leakage of lubricants is also impossible. Smooth running with only a small amount of lubrication is obtained by the milling of the axle and perfect construction of the working parts.

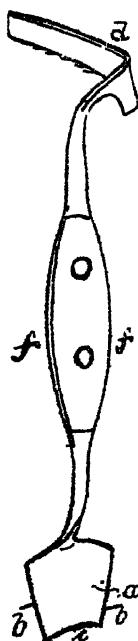
The above-mentioned details afford an example of the degree to which certain parts of machines may be improved.

844 — **Patent Implement for Singling Beets** (German Patent 248355). — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 23, p. 279. Berlin, March 19, 1913.

This implement made in one piece combines two utensils required for the singling and hoeing of beets. As the annexed figure shows, one end of the tool is formed by a curved blade with cutting edges on both sides (*b*) and in front (*a*). At the other end there is a narrow knife bent obliquely at an obtuse angle. Between the two ends a wooden handle is situated.

By means of this implement the beets may be singled, weeds removed and the earth loosened. The curved blade (*a*) is driven into the ground in the immediate vicinity of the plant that is to be left, and the edges (*b*) are pressed and turned right and left in the ground about it, thus destroying the unnecessary beets and weeds. The cutting edge (*c*) is used against weeds reaching low down. The blade (*a*) is bent in such a way that the edges (*b*) are situated almost parallel to the handle, but in such a way that the operator's hand does not come into contact with the soil.

The bent knife (*d*) at the other end of the implement is used as is well known, for singling other beets, hoeing and loosening the earth at a greater distance from the beet which is left.





# Crushing Mill "Unica No. 2" with "Unica" Sifter.

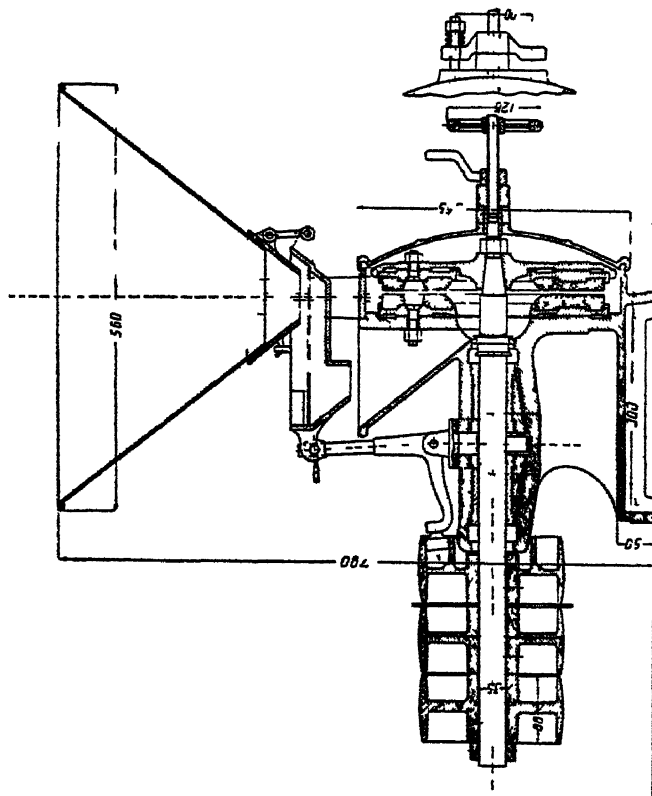


Fig 1 — Longitudinal section of mill

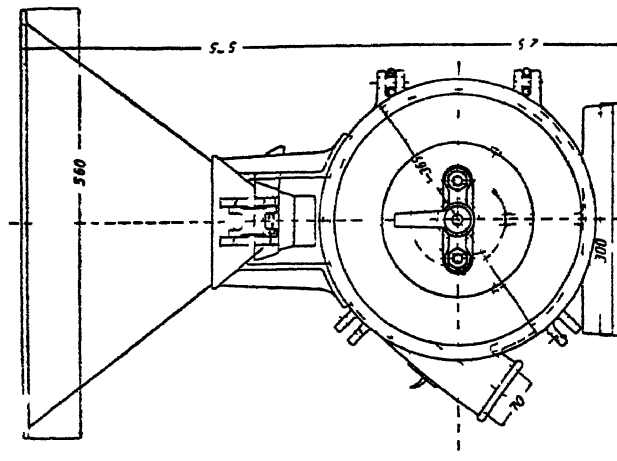


Fig. 2. — Front elevation of mill.

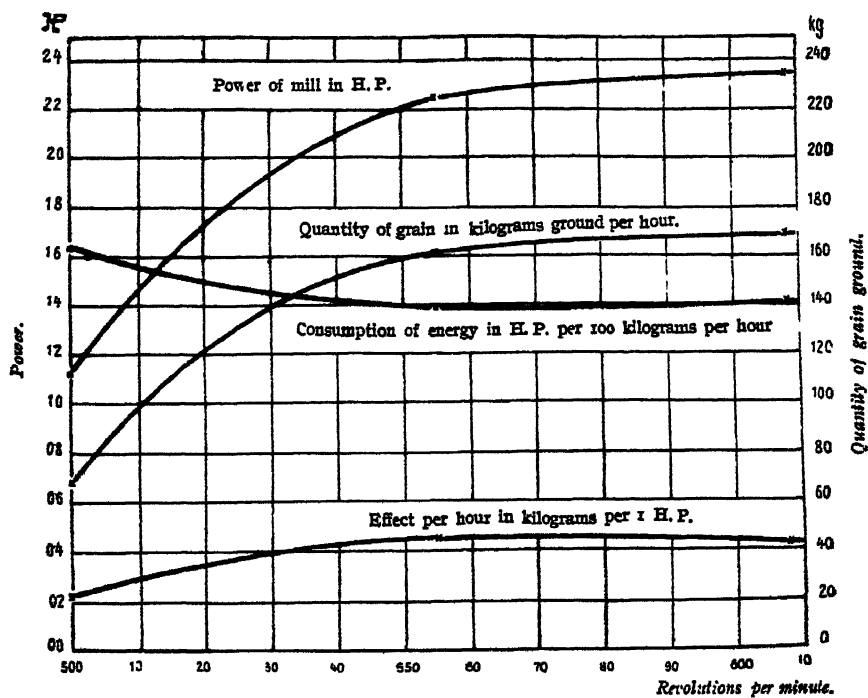


Fig. 3. — Diagram of the work done and of the work absorbed by the mill according to the number of revolutions.

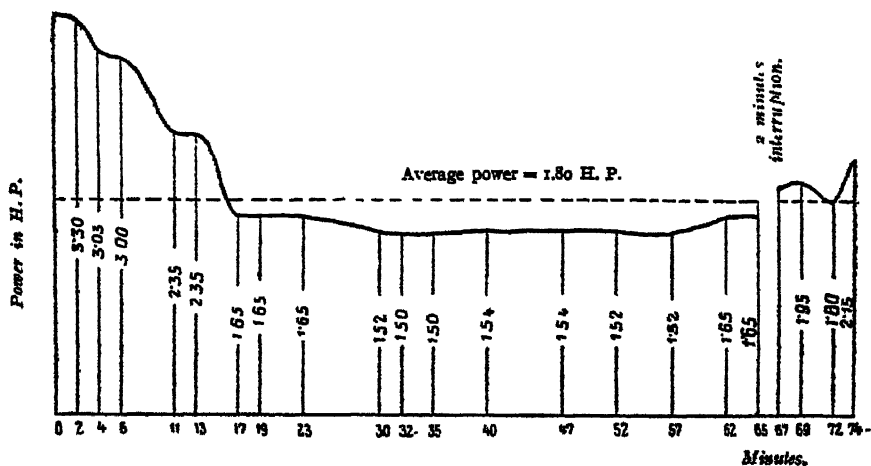


Fig. 4. — Diagram of consumption of energy required for grinding 55 lbs. of rye.



845 - **The Roller and Packer.** — BONEBRIGHT, H. B. in *Montana Agricultural College Experiment Station, Circular* 21, pp. 26-32. Bozeman, February 1913.

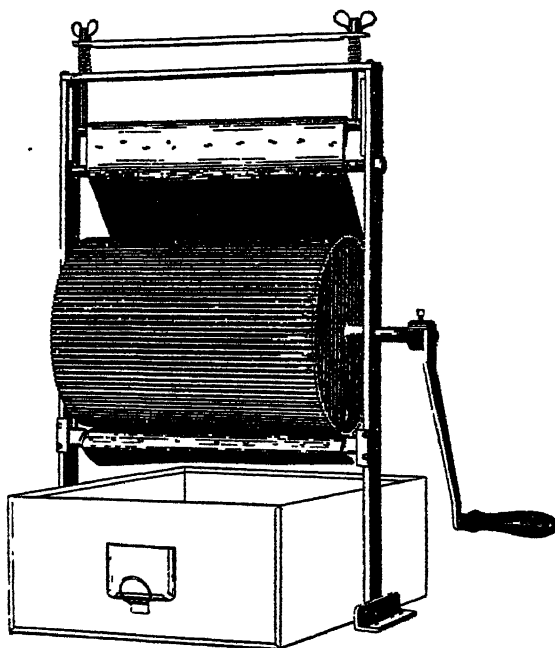
The writer describes the construction of cement corrugated rollers which are of two types: those made with wheels of cement with bare faces, and those with cement wheels having steel faces.

Among the illustrations accompanying this circular is one of a corrugated roller of which only the discs, which are placed loose on the axis, are of cement, the rims being of steel, while another figure shows a roller made entirely of cement.

846 - **A Hand Grain Thrasher.** — BRIGGS, L. J. in *U. S. Department of Agriculture. Bureau of Plant Industry, Circular* No. 119, pp. 23-24. Washington, March 29, 1913.

The simple hand thrasher shown in the accompanying illustration has proved very useful in thrashing small quantities of grain from experiment plots. It consists of a rotating rubber-covered cylinder 8 inches in diameter and 12 inches long, and a stationary apron, the tension of which, and its distance from the cylinder, may be adjusted at will.

The frame of the machine is of steel, and the cylinder is built up from disks of wood 2 inches thick glued together. The cylinder is covered with rubber matting, the corrugations of which are parallel to the axis. The matting is secured by tacks and staples and can easily be removed when worn. The apron is of rough canvas or similar material.



Essential features of the machine are the care with which the position of the apron and its distance from the cylinder can be adjusted. The whole machine can also easily be cleared.

847 - **American Cereal Esiccator.** — HOFFMANN, I. F. in *Zeitschrift des Vereins Deutscher Ingenieure*, Vol. 57, No. 21, pp. 809-817. Berlin, May 24, 1913.

The writer treats first of all of the difficulties which attend the esiccation of cereals. He then describes six esiccators of various types: 1. The Chicago Ellis Drier Company's cereal drier. 2. Hess' esiccator. 3. The

Eureka drier, built by S. Howes of Silver Creek, N. Y. 4. Mc Daniels' drier. 5. Morris' drier and the paddle wheel drier of E. F. Mead of New York. The great quantity of air used in the American driers is remarkable, no less than 400 to 480 cubic feet per 100 lbs. of grain, representing a great waste of heat and of power. Though the American types of driers deserve to be studied, they cannot be considered as the last word in the question of cereal esiccators.

848 - Ventilator for Chaff-Cutting Machine, built by Wilhelm Graf, Machine Works, Karlsruhe i. B. (German Patent 187611). — HOLLIDACK in *Mitteilungen des Verbandes landwirtschaftlicher Maschinen-Prüfungs-Anstalten*, Year 7, Part 1, pp. 5-11. Berlin, 1913.

This ventilator for chaff-cutters is built in several sizes. Size No. 3, weighing 440 lbs. and costing about £ 25 in 1911-12, was submitted to a careful test at the Royal Württemberg Machine Experiment Station at Hohenheim. It appears very advisable in large farms, especially where valuable horses are kept, to ventilate hay and straw at the same time that they go through the chaff-cutting machine. The fragments of clover leaves and similar forage that get removed with the dust form a negligible quantity compared with the mass of forage treated, and when this is of good quality they may be kept and fed to pigs.

The machine is solidly built and has proved durable. It requires a motor of about  $1\frac{1}{4}$  H. P. to drive it.

849 - Trial of a Meal and Groat Mill, "Unica No. 2", and Attached Sifter of A. Flebinger's I. Styrian Milling Machinery Works in Graz. — REZEK, J. in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der K. K. Hochschule für Bodenkultur in Wien*, Vol. I, Part 4, pp. 585-589. Vienna, May 8, 1913.

A simple solid wooden framework bears the meal and groat mill and contains the sifter in its central part. The lower extremity of the framework is fashioned like a box and holds two drawers for the reception of the ground product. The individual details of construction of the mill are shown in the section, fig. 1, and elevation, fig. 2, and do not require special description.

The total weight of the machine is 482 lbs.

The machine was tested on July 10, 1912. A continuous current electric motor with switch regulator was used as driving power, and the work done was measured with precision by electric instruments.

At first barley was ground to fine grit for 13 minutes. Then oats were ground for 10 minutes, and after these coarse ground yellow maize was experimented upon three times in succession.

More complete tests were made with rye. The observations and results of these experiments are shown in the graph, fig. 3, which shows also that the most favourable number of revolutions for this mill is about 560 to 570.

Determinations were made of the amount of force required by the mill and sifter, including the losses due to the belting. From the values shown graphically in fig. 4, it is seen that the average power required is 1.80 H. P.; the total amount for the grinding of 55 lbs. of rye is 2.2 H. P. hour; the maximum, as shown by fig. 4, was 3.3 H. P.

From the above it appears that the mill performs a relatively large amount of work with a small consumption of power, and that it would be economically advantageous to those farmers who, besides preparing coarse meal for their live stock, wish to grind their grain for baking purposes.

850 - **Testing the Hourly Performance of the Hand Centrifugal Milk Separator ("Balance No. 61" for 225 litres) of Holler's Carlshütte Factory in Rendsburg.** — REZEK, J. in *Österreichische Molkerer-Zeitung*, Year 20, No. 8, pp. 115-118. Vienna, April 15, 1913.

On November 28 and 29, 1912, this centrifugal separator weighing 36 kg. (79.3 lbs.) when in working order and costing £ 12, was tested at the Testing Station for agricultural machines and implements in Vienna, which belongs to the "K. K. Hochschule für Bodenkultur".

The writer first gives a detailed description of the machine and then an account of the tests and their results. The relation between the force expended and the work performed by the centrifugal apparatus was estimated, both by an electric process of measurement, and by Leuner's spring-dynamometer.

A total of 17 cream separation operations were carried out, the results of which are tabulated. According to these data, in ordinary dairy procedure only 0.12 per cent. of fat, on an average, is left in the skimmed milk; this may be considered a very creditable performance. With a decrease of about 20 per cent. in the number of revolutions, the average increase in the fat content of skimmed milk was 0.22 per cent. and when the temperature of the milk fell to 20° C., the percentage of fat still remained at 0.21.

The machine makes very little noise when in motion. Its construction is simple; all the different portions are easy of access and are very well made. No particular skill is required in taking the apparatus to pieces, or in cleaning it and putting it together again, and the whole operation only occupies a few minutes. The cleaning of the discs is much facilitated by the presence of a wire rod upon which they are threaded.

Taking the results as a whole, a very favourable judgment was passed on the apparatus in question.

851 - **Temperature Regulator.** — SCHOLZ, M. in *Milchwirtschaftliches Zentralblatt*, Year 42, Part 10, pp. 301-305. Hannover, May 15, 1913.

It is not an easy task for the employees of a dairy to keep a constant and uniform temperature in the apparatus for warming milk. The writer has invented a regulating device which has the object of rendering the warming of milk and keeping it uniformly at the required temperature much easier.

This new regulator is distinguished by the facility with which its component parts may be changed; it is constructed on the principle that the expansion or contraction of a body called the "feeler", which is placed in the milk outflow, closes or opens the cock which admits steam to the heater. The admission of steam is thus regulated directly by the temperature of the milk outflow. The writer gives, in his paper, a short description and illustration of the three types of this new regulator.

**852 - Review of Patents.***Machines for Tilling the Soil*

- 259 892 (Addition to Patent 228 891) (Germany) Gang ploughs for working the soil to various depths.  
 59 632 (Austria). Motor plough.  
 59 633 (Austria). Cultivator.  
 1 061 354 (United States). Spring-tooth cultivator.  
 1 061 291 (United States). Automatic adjusting plough.  
 2 130 (England). Motor plough.  
 130 182 (Italy). New system of mechanical ploughing with electric, steam or gas power.  
 59 816 (Switzerland). Motor plough.  
 59 817 (Switzerland). Cultivator.  
 258 861 (Germany). Farmyard manure spreader in which the manure is comminuted by a special cutter before being spread.  
 59 813 (Austria). Manure spreader.

*Sowing machines.*

- 259 261 (Germany). Multiple furrow potato drill with chain of cups under the hopper.  
 59 572 (Austria). Sowing machine.  
 59 573 (Austria). Steering gear for machines cultivating rows.  
 1 061 317 (United States). Mechanism for grain-drill.

*Mowing machines.*

- 259 532 (Germany). Reaper and binder with movable motor to be placed on the frame.  
 6 578 (England). Agricultural mowing machines.  
 8 763 (England). Attachments for mowing machines.

*Threshing machines.*

- 1 060 890 (United States). Threshing machines.  
 7 971 (England). Threshing machine.

*Other agricultural machines and implements.*

- 59 815 (Austria). Machine for beating out scythes.  
 59 808 (Austria). Agricultural watering machine.  
 1 060 828 (United States). Milking machine.  
 129 433 (Italy). Grain drier.  
 130 358 (Italy). Drier for rice, maize, etc.  
 59 818 (Switzerland). Automatic hay lifter for carts.

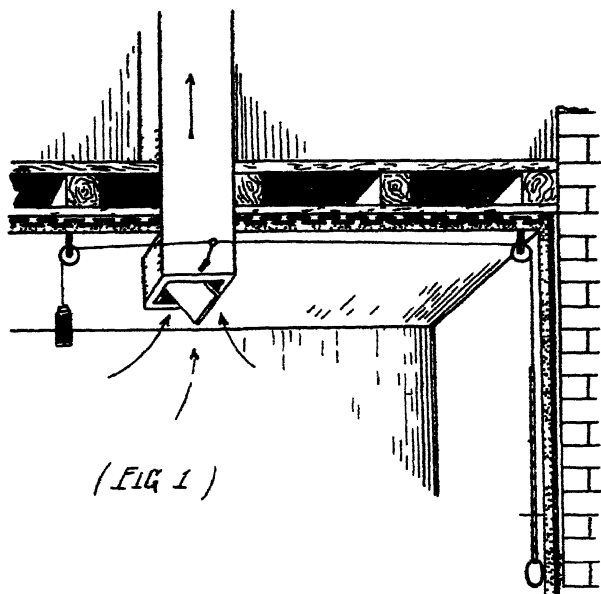
**BUILDING-  
CONSTRUCTION**

- 853 - Systematic Ventilation of Stables.** — *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 16, pp. 191-192. Hannover, April 18, 1913.

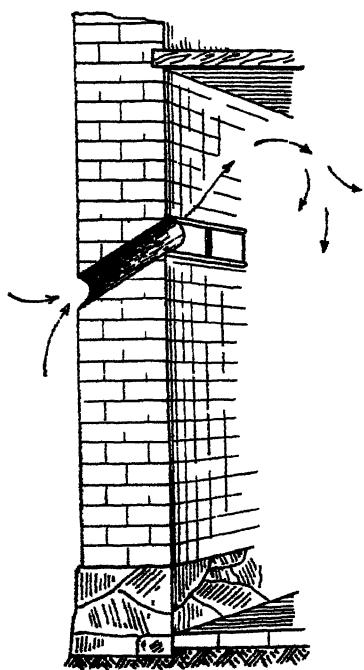
In the proper ventilation of a stable, the vitiated air must escape and be replaced by pure air without draughts being formed or the temperature being lowered.

The escape of the foul air is easily obtained by means of one or more vertical flues in the roof of the stable. The upper end of the flue must be sufficiently high that the motion of the air in it should not be affected by the outer currents of air, and its lower aperture projecting 6 or 8 inches into the stable must not be situated immediately over the animals. The escape flue may be in the middle of the stable or at the end opposite to the aperture by which pure air is introduced (See fig. 1).

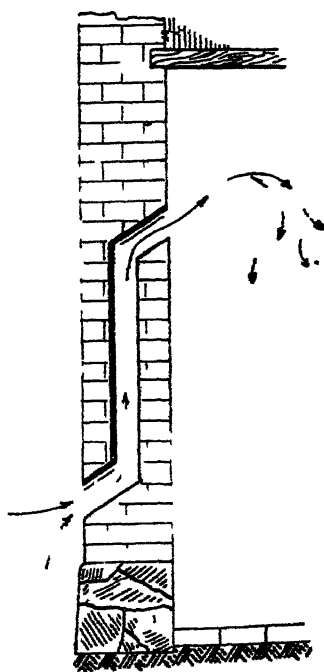
Four-sided shafts made of boards planed smooth on the inside are very suitable. They are easily made and are cheap and they have besides the



(FIG 1)



(FIG 2)



(FIG 3)



advantage that, wood being a bad conductor of heat, they do not easily cool, which would retard ventilation. If the stable is not immediately under the roof but under other rooms or a hay loft, the shaft must have a fire-proof casing on the outside; in order to draw well it should also be provided with a suction-cowl at the top. The section must be 8 X 8 inches for three head of large stock, 10 X 10 in. for six and 12 X 12 in. for nine head. For more than nine head it is advisable, to use several shafts. As it is sometimes necessary, especially during stormy weather, to close wholly or partially the opening in the roof, the shaft is provided with a shutter.

2. As for the introduction of pure air, this is still simpler. According to practical experience the aperture which admits the outside air is most advantageously situated at about two thirds the height of the stable. As fig. 2 shows, a simple hole in the wall, obliquely ascending from the outside to the inside, is sufficient. The cold exterior air flows into the upper part of the stable where it gains some warmth and then spreads throughout the stable. If the intake be placed too high the draught in the ventilator is diminished or even ceases. These openings must also be provided with sliding shutters to admit of their being closed when necessary. Their cross-section should be 5 X 10 inches for every three head of large stock. In new buildings glazed earthen pipes can be conveniently built into the walls as in fig. 3, the inlet being situated about 20 inches above the ground.

## RURAL ECONOMICS.

854 - Calculation of the Cost of Production in Peasant Farms, with Special Reference to Milk. — PAUL W. in *Archiv für exakte Wirtschaftsforschung*. Supplement, Part 7, pp. XI + 333. Jena, 1913

RURAL  
ECONOMICS

In the introduction, the writer lays stress on the importance of the calculation of the cost of production, from the scientific and social points of view, as well as from that of private economy. He then reviews its theoretical and practical evolution from its origin, at the beginning of the seventeenth century, up to the present time in which it has attained considerable development.

The methods pursued now in the calculation of the cost of production of agricultural staples may be divided into two groups: 1) those in which the costs of production are deduced from the results of the single branches (accounts), or "account" or "analytical" methods; 2) those in which the costs of production are derived from the total results of the farms, or the "totality" or "synthetic" method ("Einheitsverfahren") of Laur.

The analytical method may be applied: 1) with book-keeping by double entry (systematic calculation); 2) with book-keeping by single entry in which account is kept of the amount of labour required, the exchange of products and the special occasional accounts connected with them (occasional calculation); 3) with estimated, more or less arbitrarily chosen, averages (speculative calculation); 4) with the industrial method of special calculations. The question as to which kind of calculation is to be chosen

can only be answered for each single case according to the extent of the farm, the degree of culture of the farmer and the kind of production.

The results of the analytical methods of calculation in agriculture are in a great measure dependent upon: 1) the choice of the unitary price adopted for the calculation of the produce; 2) the distribution of the cost of labour, 3) the distribution of the cost of manuring among the various crops of a rotation.

In the selection of the unitary prices to be employed in the calculation, the following are to be distinguished :

1. Values of cost of production. . . . .	}	Absolute cost.	} Purchase and production values	
2. Purchase price delivered at the farm. . . . .				
3. Relative purchase price (calculated on the purchase prices of equivalent wares, capable of replacing them, delivered at the farm). . . . .	}	Relative or deduced cost.		
4. Relative cost of production (calculated on the cost of production of equivalent wares) . . . . .				
5. Sale prices at the farm . . . . .	}	Realization values.		
6. Relative sale prices at the farm (calculated on the sale prices of similar products) . . . . .				
7. Transformation value (value of produce that has been worked up, minus the cost of transformation). . . . .				
8. Relative transformation values (for by-products calculated on the transformation value of the principal product) . . . . .				

Before selecting the values which are to serve as prices in drawing up the various accounts, some economic considerations are to be made according to the following principles : In the account the values here given are to be taken:

1. The cost of production, when the other purchase prices are higher and the realization values, especially the sale prices, are lower than the cost of production.

2. The purchase prices for goods delivered at the farm, when these are inferior to the costs of production.

3. The sale prices, at the farm, when these are higher than the costs of production.

When the costs of production of a commodity are to be determined for a whole country (costs of production applied to political economy) the prices of foreign markets are to be used for determining the market prices. As a rule, though, the costs of transport and brokerage makes such a difference between purchase and sale prices of goods delivered at the farm, that the cost of production will stand between the two, whence as a rule only the cost of production will have to be considered. Only those commodities that must not be produced in the country are to be calculated at market prices, delivered at the farm (for instance concentrated foods).

The best distribution of the cost of labour is according to the number of work days, distinguishing between summer and winter work days, and between the work of men and that of women (Method of the Deutsche Landwirtschafts-Gesellschaft and of Laur). The cost of management is included in the general expenses and distributed with these.

For the distribution of the cost of manuring within the rotation, the writer recommends two simple methods, of which one considers the unexhausted manure given, and the second assumes that the amortization is balanced by the subsequent manuring. The first method starts from the money value of the original quantity, to which the cost of applying the manure is added, and one half of the total is debited to the second crop. In commencing this calculation it should be sufficient to determine the amount of manure given during the last three years and then reckon one half of the manure given the last year, one quarter that of the second year and one eighth of that of the third year. The gain in nitrogen due to the roots and stubbles of leguminous plants may in both methods be considered as manure. In the second method the meadows and every rotation are considered as units which are debited with a certain amount of manure. The cost of manuring is divided, within each rotation, among the various crops in proportion to the gross yield of each. This method gives approximately accurate results so long as the rotation is kept uniformly manured.

For several practical reasons the calculation of the cost of production according to the analytical method, as well as the book-keeping by double entry upon which it is based, cannot be carried out on peasants' farms. On these only the synthetical method (*Gesamtkalkulation*), based upon a system of book-keeping by single entry uniformly carried out, can be applied, and this also only by strict comparative working up of the results of a large number of farms. In this synthetic process the difference of the net revenue (*Reinertragsdifferenz*, or difference between the net revenue and the normal rate of interest of the farm capitals which concur in yielding product) is expressed as percentage of the gross revenue, which percentage gives the difference between the cost of production and the prices of the products. If the unit price of a product is known, its cost of production can be easily calculated.

In specialised farms, the risk and consequently the difference of the net revenue, in the calculation of the cost of production of the principal product, may devolve entirely upon this product. Thus, for instance, the production of milk in a dairy farm. It follows that the synthetic method is convenient for the calculation of the costs of production, especially for the central offices of agricultural book-keeping for peasants' farms, which are in a position to group the farms according to the most varied points of view.

The manner of calculating the gross returns and the expenses has the greatest influence on the results. The writer understands by "gross returns" the result of agricultural activity that is expressed by the quantity and the value of the commodities that are produced, transformed or also only newly acquired (according to Laur) by this activity. These gross returns are calculated: 1) from the cash account, 2) from the amounts

of produce in kind supplied to the farmer's household, family and employees, 3) from the changes in the inventory in the course of the year. The products supplied in kind are chiefly to be valued according to the market prices at the farm. On the other hand, the valuation of the inventory should be made according to the cost of acquisition, so long as this is not in excess of the realisation prices. The writer gives the tabular form adopted by the Swiss Peasants' Secretariat for the calculation of the gross returns and their distribution among the various accounts. Even if this calculation of the gross returns does not include completely and exactly some accounts and some groups of capitals (plantations of trees and vines, and live stock) and therefore keeps the total gross returns somewhat too low, the result of the calculation of the cost of production is not thereby much affected and at most to the average extent of about  $\frac{1}{2}$  per cent.

The working expenses consist ultimately of labour and capital, the fundamental factors of agricultural production, because in farming undertakings even the natural factors appear from the economic point of view as capital.

In the valuation of labour, the value of the management and capacity of organizing possessed by the farmer has also to be considered, as well as the labour of the other members of his family, which have to be reckoned somewhat dearer than that of strangers.

The capitals employed in farms are divided by Laur into "elementary capitals", which he arranges in to higher groups. For the calculation of the interests that each elementary capital is to bear he gives the following rates:

For capital in land . . . . .	3.5 to 4	per cent.
"  "  in buildings, improvements and forest trees	4 to 4.5	"
"  "  in fruit trees and vines . . . . .	5 to 5.5	"
"  "  in standing crops . . . . .	6	"
"  "  in live stock . . . . .	{ productive stock . . 5.5 to 6 draught animals . . 5 fattening " . . 4.5	"
"  "  in machines and implements . . . . .		4.5
"  "  circulating capital (provisions and cash).		6

Thus an average rate of interest is 4 to 4.5 per cent. for the total capital (taking into account the proportion of the various elementary capitals that make up the total capital the interest would be 4.3 per cent.).

Besides their demand for interest, capitals weigh upon production for amortization and upkeep, insurance and taxes. The cost of upkeep concerns especially the capital invested in improvements, buildings, machines and implements. Average figures are not easy to give, for the amount of amortization depends to the greatest degree on the nature of each item of capital. The writer gives the figures as they have been determined by the Swiss Peasants' Secretariat. As for taxes the writer

recommends that all the State taxes, or at least all the communal taxes which weigh on the farms as land tax, should be included in the working expenses. In the conclusion of this first (general) part he gives in the form of a table a summary for the calculation and division of all the working expenses.

In the second (special) part of his work the writer calculates according to the synthetic method the cost of production of milk in the Swiss peasant farms, basing his figures on the data elaborated by the Book-keeping Office of the Swiss Peasants' Secretariat during the years 1905 to 1909.

He shows first that the calculation of the probability of errors should be applied to the calculation of the cost of production in order to determine the limits of error in the individual and average results. In the following results of calculations the writer gives, in the tables, the probable mean oscillations calculated according to the usual method of minimal square, so that their ratio to the actual differences of the results to be compared can be easily seen and thus the value of the average results for practical conclusions may be measured.

For the calculation of the cost of the production of milk only the results of typical dairy farms were used: These were further divided:

- 1) According to the system of cultivation:
  - a) Farms based on pastures and meadows.
  - b) Farms based on clover-leys, pastures and meadows.
  - c) Other farms (based on three-year rotation, or with meadows, pastures and field crops).
- 2) According to the manner of replacing the live stock:
  - a) Farms without breeding stock.
  - b) Farms with breeding stock.
- 3) According to the mode of utilizing the milk:
  - a) Farms with retail sale of milk.
  - b) Farms with wholesale sale of milk:
    - a) in which the milk by-products (whey and skimmed milk) return to the farm,
    - β) in which the milk by-products belong to the buyer of the milk.
  - c) Farms which work up their own milk.

According to the arithmetical means of the years 1905 to 1909, the average cost of production of 100 kilograms (22 gallons) of milk in all the farms is shown in the table on p. 1088.

The largest item in the cost of production of milk is labour. Doubling the price of land and keeping the rate of interest equal (4 per cent.) does not increase the price of milk by more than about 2s per 22 gallons.

An increase of wages in all its phases (direct increase in cost of labour, increase in cost of buildings and capital invested in them, increased price of stores, etc.) increases the cost of production a great deal more than a rise in the price of land.

	s	d	In per cent. of total cost	Number of accounts examined
Total cost . . . . .	13	2	100	646
Cost of labour . . . . .	5	4 $\frac{1}{2}$	40.78	644
Interest on the land . . . . .	1	9	13.37	645
Interest on capital invested . . . . .	3	4	25.30	641
Interest on working capital . . . . .		10 $\frac{3}{4}$	6.81	648
Cost of manures, concentrates, etc . . . . .	3	6 $\frac{3}{4}$	27.11	648
Price of milk . . . . .	12	6 $\frac{3}{4}$	96.45	648

The price of milk in the middle of the period 1905 to 1909 was 3.55 per cent. lower than the cost of production. Since 1905 both the price of milk and its cost of production have risen considerably, and up to 1909 the latter to a greater extent than the former. The increased cost of production was due to the increase in wages and in the prices of commodities, while up to now no influence of the changes in the prices of land has been noticed.

In order to determine the influence of the size of the farm upon the cost of production of milk, the farms included in the table given above were divided according to their extent, and the costs of production were determined for the groups thus obtained. The separate results of the groups do not allow any important effect of the extent of the farm on the total cost of production of milk to be recognized, though some factors are strongly affected: Thus, for instance, the amount of labour expended is greater in small farms than in large ones. A noticeable rise in wages affects the former more than the latter. The stores that have to be bought in the markets seem to be differently influenced by the size of the farm according to the system of farming adopted. The amount of capital invested is relatively larger in the large peasant farms than in the small ones. An increase in the rate of interest affects the cost of production of milk more in the large peasant farms than in the small ones; consequently small farms are more favourably situated than large ones in districts where the prices of land run high.

In order to judge definitely one system of farming as compared with another in regard to the effects upon the cost of production, in the first place the various climatic conditions must be considered. Consequently the farms in which breeding and the wholesale disposal of milk are practised were, within the various groups according to the system of farming, sub-divided again according to the yearly rainfall; the accounts set up for these groups showed: that in districts with above 47.2 inches (120 mm.) of rainfall the pasture and meadow farms produced the cheapest

milk, while in districts with less than 43.3 inches (110 mm.) it was the clover, pasture and meadow farms that did so. The ratio between these two types of farms in districts where the rainfall is between 43 and 47 inches cannot be determined from the results at present available. Of the other forms of farms (improved three-year rotation and similar forms) it appears that the production of those receiving upwards of 47 inches of rainfall is dearer than that of the pasture and meadow farms, and that of those getting from 43 to 47 inches is dearer than that of grass and clover farms; in districts with rainfall from 39 to 43 inches, and also below 35 inches, production on such farms is dearer than on the clover farms. Considerably increasing wages favour the grass farms, while strong rises in the prices of commodities favour the clover farms.

Supported by these results the writer recommends, in connection with the production of forage and of milk: 1) in districts having a rainfall higher than 47 inches to keep up the pastures and meadows or to introduce them and to abandon clover farming; 2) to transform the improved three-year rotation in districts with less than 43 inches of rain into clover farms, and where the rainfall is above 47 inches into meadow and pasture farms, and in the intervening districts into clover and grass farms. The decision of the question whether in the last-named districts clover or grass farms are to be preferred rests chiefly with the conditions of the soil and of labour.

As for the influence of the manner of keeping up the dairy herd on the cost of producing milk, it appears from the accounts examined that those farms that only milked purchased cows produced their milk more cheaply during the years 1905 to 1909 than those that bred their milk-stock. The profitableness of the former is due to the high prices of the produce and especially to the lower cost of production. High rates of wages increase the cost of breeding more than they do the production of milk, and thus favour, other conditions being equal, those farms that do not breed. Great rises in the prices of stock, on the other hand, favour breeding farms.

With the object of recognizing the influence of the utilization of milk on the cost of producing it, the groups divided according to systems of utilization (retail or wholesale disposal of milk) were subdivided according to the system of farming, then according to this and to the rainfall. Both calculations agree in attributing a higher cost of production to farms practising retail sale of milk than to those dealing wholesale. The relatively great differences are chiefly due to the expense and work of retailing.

With the increase in the degree of intensity, the cost of the production of milk reduced to unit of returns increases also. Thus the law of diminishing returns holds good also in the production of milk. The gross returns of milk for a certain unit of expense diminish with the increase of intensity. Every addition to the expense causes the produce to become dearer. But the peasant does not seek an absolutely cheap production, but a high profit and respectively a high income from the land. This is also determined by the height of the prices of the produce. The knowledge of the costs of production are not, therefore, sufficient guide in the selection

of the most advantageous degree of intensity. The calculation of the cost of production must be completed by a comparison with the current prices of the profitability of an undertaking. The writer consequently investigates the influence of the intensity of the farm upon the land rent and the income, and draws the following conclusions from the results of his calculations: With diminishing cost (improvement of technique, etc.) and increasing prices of production, the optimum degree of intensity moves upwards. Inversely it moves in the opposite direction: 1) when with stationary cost and returns in kind the prices of produce sink, 2) when with stationary prices of produce and returns in kind the prices of the components of the cost of production rise, and 3) when with stationary returns in kind the prices of produce rise less than the costs of production.

But when it is a question of determining whether it is advantageous or not to diminish the existing degree of intensity of the farm, account must be taken not only of the change in the returns from the land, but also of the net returns of all the capitals employed in the farm and not utilizable elsewhere, as well as of those necessary to the farm; further, in peasant farms the possibility of utilizing completely the available labour must be considered. In general it may be held that the optimum degree of intensity is shifted by changes in the technique, by the height of the prices of the components of the cost of production and by the prices of the products obtained. It follows that the optimum degree of intensity has to be determined for each individual case.

If it is desired to know what prospects of profit a certain kind of production holds out, the changes in the results and the calculation of the returns and of the cost of production caused by the variation in the market conditions have to be examined by a combination of the synthetic method with that of speculative calculation. The results given by book-keeping show the distribution of the gross returns and of expenses on the various items of outlay and gross returns, as well as the ratio of the gross returns to the outlay under the market conditions prevailing at the time. The speculative calculation must then give the mean curve of the changes in prices and examine its effect on these results. The writer accordingly calculates, with the help of a scheme of the distribution of expenses and gross returns, the amounts of the single items in the various kinds of production in the average of the years 1908 and 1909 and the average range of prices for the various products in the years 1910 and 1911 up to the month of April; in his comparative calculations he reaches the following results: The changes in the cost of production caused by the oscillations of prices during the years 1910-11 were more favourable for the grass farms than for the clover farms. For the milk farms without breeding of cattle the oscillations of prices were somewhat more unfavourable than for those that bred also, so that the former, considering the high prices of productive cattle, were no longer in such a privileged condition respecting the latter as they had been a few years previously. Nevertheless they still produce milk more cheaply than the breeding farms.

Lastly an appendix of 123 pages contains in the form of tables the individual results of these calculations of the cost of production for the years 1905 to 1909 for the farms connected with the book-keeping office of the Swiss Peasants' Secretariat.

855 - **The Over-Valuation of Estates.** — BECK, ERNST in *Monatshefte für Landwirtschaft*, Year 6, Part 5, pp. 129-133. Vienna, May 1913.

The first reason of the rapid increase of the value of land is, according to the writer, the fact that farmers at present are able to compare all the producing centres of the world as to their produce and its valuation and thus to form a better judgment on the value of land.

The second reason is in the improvement in the economic power of the class of tenant farmers, who, thanks to the use of abundant capital, have increased the productivity of the soil and consequently enhanced its value permanently.

Still a third reason of the over-valuation of land is that generally the whole returns from an estate are considered as returns given by the land, and thus as a measure of its value, while the interest of the working capital should be deducted from the total returns before calculating the capital value of the land.

Under the term working capital as distinguished from landed capital, the writer defines everything that can be separated from the estate and which on handing over the farm to the lessee remains moveable property of the lessor. On the other hand all improvements of the land itself, plantations of trees, orchards, vines, hops, osier beds, etc., as well as permanent buildings, belong to landed capital. Only the interest returned by the latter, thus the simple rent value, represents the returns of the soil and is to be taken as the basis for the calculation of the purchase price, taking the rate of interest usual in the district for safe securities.

The fourth and most important factor for the valuation of land is therefore the rate of interest: to the same extent that this sinks, does the purchase price of land rise; and as until quite recently the rate of interest has been sinking while the number of inhabitants has increased and the means of communication have improved, the higher valuation of land is easily understood.

But in order to obtain the real returns of the land, which are to be capitalized, it behoves to deduct from the total net revenue that portion due to labour, capital and agricultural capacity. It is only by keeping the installation capital and the working capital rigorously separated from each other that the difficulties encountered in the correct valuation of these capitals can be overcome. Anyhow it is advisable first to establish the value of the returns according to the natural conditions of the soil (*Bonität*) and then the varying influences of its state of cultivation which increase or diminish its natural capacity of producing. Lastly the writer suggests that the principles adopted by State expropriations be applied by law to the cutting up of large estates (*Güterschlächtereie*) into small holdings in order to protect small capitalists, such as farmers and peasants, against excessive prices for land.

856 - **The Form of Wages of Permanent Farm-Hands in Trans-Danubian Hungary** (1). — WEISS, RUDOLF in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der K. K. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 591-625 Vienna, May 8, 1913.

The writer gives a brief review of the historical development of agricultural labour in Hungary and of the forms of wages, especially of the payments in cash and in kind. He then shows by means of tables and diagrams the nature of the wages of labour during the last ten years in the 11 counties of Trans-Danubian Hungary, and the ratio between payments in cash and in kind, and gives a description of the latter. The total wages have risen considerably during the last ten years and the proportion of payments in cash to the total has constantly increased.

According to the writer it would be a great mistake in that part of the country to resort to only cash wages, for on the one hand it would lead to the ruin of the labourers owing to their want of economic preparation for such a step and on the other hand, it would be too heavy a burden for the conditions of credit of the farmers. The partial payment in kind should be kept up but it should be connected with an organization that would stimulate the labourers to become thrifty and give them the opportunity of investing their savings in such a manner as to get interest on them and in certain cases to use them as a source of credit.

The chief items of payments in kind are: wheat, milk and the keeping of live stock, the use of fields and gardens, dwelling-houses and fuel. The wages in kind that are not consumed or are saved by the labourers should be bought back by the estates at prices which should be fixed from time to time, and the proceeds together with any increase for numbers of years' service, prizes, gifts and the like should be invested in some safe public bank (Raiffeisen for instance) so as to bring in interest.

In this manner the labourer could, on reaching a certain age, become the owner of some fields or at least get the lease of them for as long as he lived, which would lead to a home colonization, that, with the further assistance of the State, would create and maintain a superior and settled class of agricultural labourers.

857 - **Three Years of Dairy Farming. The Variations in the Results and Their Causes.** — ORRIS, D. H in *Hoard's Dairymen*, Vol. 45, No. 9, pp. 341-342. Fort Atkinson, Wisconsin, March 28, 1913.

The writer deals carefully with the variations in the expenditure and returns of the farming years 1909-1910, 1910-1911 and 1911-1912, and the differences thereby shown in the remunerativeness of the undertaking.

Results	1909-10	1910-11	1911-12
Net returns . . . . .	\$ 2 183.00	\$ 2 885.89	\$ 1 944.98
From this must be deducted interest on capital at 5 %	1 078.25	1 146.20	1 637.25
Profit remaining to farmer .	\$ 1 104.75	\$ 1 739.69	\$ 307.73

(1) Under the name "Trans-Danubia" the writer designates that part of Hungary which is bounded on the North and East by the Danube, on the West by Austria and on the South by the Drave.

The sudden fall in the profits in the last year is in the opinion of the writer due to increased capitalization and working expenses.

858 - **A Comparison Between a General Farm and a Dairy Farm.** — OTIS, D. H., in *Hoard's Dairyman*, Vol. 45, No. 7, pp. 259 and 270. Fort Atkinson, Wisconsin, March 14, 1913.

The first is a general farm with grade Shorthorns and grade hogs and is compared with a dairy farm keeping grade Guernseys and pure-bred hogs. The comparison shows that the net returns in the case of the general farm were much below the normal interest on the capital invested, while the dairy farm, in spite of higher expenses and less outlay of capital, was much more paying. The writer ascribes this fact partly to the difference of the products of the two farms, and partly to the difference in management.

859 - **Farming Eight-hundred-Dollar Land at a Profit.** — DACY, GEORGE H. in *Successful Farming*, Vol. 12, No. 3, pp. 54 and 58. Des Moines, Iowa, March 1913.

A description of an estate of 400 acres worth \$ 800 per acre and the manner in which it was farmed. Owing to intensive and skilful cattle and pig breeding the yearly profit is 4 per cent. on the total capital expended.

860 - **The Importance of Public Valuation Offices for Estates and Farms.** — ROTHEGEL, WALTER in *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 13, pp. 102-106 and No. 16, pp. 110-111. Berlin, April 14 and 21, 1913.

The importance of the correct valuation of landed property according to income-tax and ground-tax, or the total value.

Alterations and adaptations to present requirements. The organization and work of the projected valuation offices: local valuation offices, central office; drawing up and making valuation tables («Tax rahmen») of the sale prices of estates. Advantages of these measures for the reform of the rights of expropriation, for the alteration of the principles of legal taxation, for the science of agricultural practice, for agricultural statistics and practical estate management.

## AGRICULTURAL INDUSTRIES.

861 - **The Use of Cold in the Dairy.** — RÜTERS, P. in *Zeitschrift für die gesamte Kälte-Industrie*, Year 20, Part 5, pp. 95-101. Munich, May 1913.

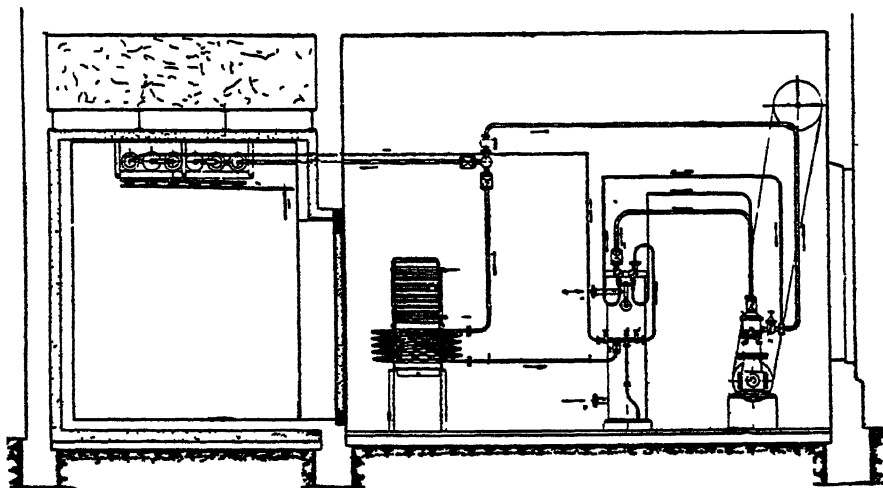
According to a lecture given by the writer at the Congress of the «Deutscher Kälteverein» (German Association of the Refrigerating Industry) dairies can be divided into three principal groups. The first group, to which most dairies belong, comprises purely rural concerns. They deal almost exclusively only with the manufacture of butter, and can treat about 880 gallons of milk per diem. They possess machines for measuring the quantity of milk used, for separating the cream, for heating the milk and churning the cream.

The second group is that of town dairies which by retailing the milk directly to the public sell it more advantageously. The size of these dairies

varies very considerably. Some deal with only 220 gallons a day, others attain 22 000 gals. The third group utilizes milk in various ways and possesses an industrial character.

As for the application of cold, it may be said that the cooling apparatus of the rural dairies are the easiest to handle and the cheapest. After the cream has been warmed it is immediately cooled, mostly with well water and brine to 2 to 4° C.

This cooling is done in the cream coolers at present used, namely large vessels provided with cooling worm, cooling pipes or double sides, through



which cold water, sometimes brine, circulates. Frequently boxes filled with ice are suspended in the cream, or frozen milk is mixed with it.

For town dairies the refrigerating machine is a necessity. Direct evaporation in the milk cooler is preferred, as the action of the refrigerator is much greater than with the brine cooling.

The annexed figure shows an installation of this kind with direct evaporation in the milk cooler and with a system of cooling pipes.

In the third group of dairies, those that work up the milk industrially, cooling is so far important inasmuch as it allows the milk to be kept at a low temperature until required for the various processes to which it is subjected.

#### 862 - Modifications in the Composition of Cows' Milk Due to the Use of Drugs.

— LANZONI, OLIVIERO in *La Clinica Veterinaria*, Year 36, Parts 1 and 2, pp. 11-23 and 58-69. Milan, January 15 and 30, 1913.

The writer has studied from the experimental point of view the variations in the percentage composition of cow's milk due to the use of certain drugs.

The substances chosen were: 1) sodium sulphate, 2) magnesium sulphate, 3) rhubarb, 4) aloes, 5) arsenic; all of these are much used in every day medical treatment.

The bibliography of the subject does not include any treatise dealing directly with the question; the works of Malapert, Porcher and others (Peligot, Labourdet, Reveil, Fehling, Sigalas and Dupouy, Baum, Strumpel, Flamini, Van Itallie, Nicloux, Ovi, Fieux, Leclairche, Lewald, Harrier, Henry, Orfila, Falke, Simon, Marchand, Rombeau, Roseleur, etc.) mention the possibility of certain drugs passing into the milk, but do not consider the changes in the percentage composition of the latter which may be due to their agency. Such modifications, as is well known, depend not only upon medicinal compounds, but also on many other factors: 1) breed, 2) age, 3) time of milking, 4) general conditions of living, 5) work, 6) pathological conditions, 7) physiological conditions (heat, gestation, castration), 8) massage of the udder (*mastagogia*), 9) feeding, 10) air, 11) individuality.

All possible precautions were taken to eliminate the influence of these other factors and to avoid any modifications due to the latter being attributed to the effect of the drugs.

Two samples of milk were taken from each cow, one before and the other after the administration of the medicine, and the differences due to the latter were noted. The cows which furnished the samples for analysis were kept quiet in the shed and fed exclusively upon hay during the absorption of the drug and the period immediately following this. The second sample was taken 24 hours after the dose had been given. The purgatives (saline and cathartic) were administered once, while the arsenic was given in repeated and progressive doses (from 80 cgr. to 1 gr.).

The results of these experiments, as regards the different components of milk, may be summarized in the following manner:

1) The *total solids* show an increase with the salts (+ 0.81 % with sodium sulphate; + 2.64 % with magnesium sulphate), while a diminution occurs with the drugs and arsenic (— 1.38 % with rhubarb, — 1.40 % with aloes, — 1.46 % with arsenic).

2. The *fat* undergoes the most marked alteration: with the salts it increases to a considerable extent (+ 0.94 % with sodium sulphate, + 2.05 % with magnesium sulphate), while it diminishes with the drugs and arsenic (— 0.80 % with rhubarb, — 0.14 % with aloes, — 0.26 % with arsenic).

2. The *casein* is the next most variable compound; it increases with the salts (+ 0.19 % with sodium sulphate, + 1.03 % with magnesium sulphate), while it diminishes with the drugs and arsenic (— 1.50 % with rhubarb, — 1.91 % with aloes and — 0.95 % with arsenic).

4. The *albumen* present increases in all cases (+ 0.02 % with sodium sulphate, + 0.10 % with magnesium sulphate, + 0.04 % with rhubarb, + 1.43 % with aloes and + 0.09 % with arsenic).

5. *Milk sugar* (lactose) diminishes with all the medicines except rhubarb (— 0.26 % with sodium sulphate, — 0.28 % with magnesium sulphate, — 0.75 % with aloes, — 0.26 % with arsenic, + 1.01 % with rhubarb).

6. The *ash* constantly diminishes ( $-0.08\%$  with sodium sulphate,  $-0.26\%$  with magnesium sulphate,  $-0.13\%$  with rhubarb,  $-0.03\%$  with aloes,  $-0.08\%$  with arsenic).

7 and 8. The *density of the milk and of the milk serum* show only slight variations; they are increased by the salts (*density of milk*:  $+0.004$  with sodium sulphate,  $+0.004$  with magnesium sulphate; *density of serum*  $+0.002$  with sodium sulphate,  $+0.004$  with magnesium sulphate), but diminished by rhubarb and arsenic (*density of milk*:  $-0.002$  with rhubarb,  $-0.004$  with arsenic; *density of serum*:  $-0.002$  with both rhubarb and arsenic); with aloes there is no change in either).

The writer comes to the following conclusions based on the above results:

1) It is very probable (leaving out of account the question of the passage of rhubarb, aloes and arsenic into the milk) that sodium and magnesium sulphates do not find their way into the milk (contrary to Malaperts' statements).

2) The salts, rhubarb, aloes and arsenic actually produce considerable alterations (physiologically explicable) in the chemical composition, and these affect the chief nutritive constituents of the milk.

3) This alteration may consist in the loss of all nutritive property owing to the great decrease in the total solids, or it may be that the milk is unsuitable as a food (e. g. from an excess of casein rendering it indigestible); but in any case, being of pathological origin, such milk is not hygienic, and should not be sold except for special purposes and under the name of "medicinal milk". This last conclusion is the principal result of the experiment.

863 - **Chemical Changes Produced in Cows' Milk by Pasteurization.** — RUPP, PHILIP, U. S. Department of Agriculture, Bureau of Animal Industry, *Bulletin* 166, pp. 15. Washington, April 22, 1913.

The writer mentions that one of the objections frequently raised against pasteurized milk is that the heating produces changes in the chemical composition which makes it unsuitable for infant nourishment. It is claimed that a portion of the soluble phosphate of lime becomes insoluble, and that this change produces defective nutrition, while the changes in the lactalbumin and in the casein render the pasteurized milk more indigestible than raw milk, and therefore inferior as a food.

The objects of the works herein described were to study the chemical changes produced by the heating of milk at the different temperatures used in commercial pasteurization, and to determine whether a temperature that destroys all pathogenic germs can be used in pasteurization without having any appreciable effect on the chemical composition of the milk.

The milk was pasteurized in a constant temperature bath; the water having reached the required temperature, the cool milk, in an Erlenmeyer flask closed with a valve to prevent evaporation, was placed in the water and occasionally moved about until it had acquired the temperature of the water. This usually required from 15 to 20 minutes, according to the

height of the temperature. It was then allowed to remain for 30 minutes, after which it was rapidly cooled to about 53° F.

The writer studied separately and carefully the changes in the phosphates, in the proteins and in the acidity of the milk.

He gives the results obtained by other investigators and describes the methods of filtration, analysis and coagulation (of the casein) employed in his researches.

His summary and conclusions are as follows :

1). Milk pasteurized by the "Holder" process at 145° F. for 30 minutes does not undergo any appreciable chemical change.

2). The soluble phosphates of lime and magnesia do not become insoluble. At 155° F. the quantity of phosphoric acid, lime, and magnesia in the serum of both raw and pasteurized milk is practically the same.

3). The albumin does not coagulate at 145° F., but at 150° F. 5.75 per cent. of the albumin is rendered insoluble. As the temperature increase the amount of coagulated albumin increases. At 155° F. the quantity is 12.75 per cent. and at 160° F. it amounts to 30.78 per cent.

4). The time required for coagulating the casein by rennin is slightly less in milk pasteurized at temperatures up to 149° F. than it is in raw milk. At 158° F. there is a slight retardation, while at 167° F. the time is almost twice as great.

5). The acidity as determined by titration, is slightly diminished in pasteurized milk.

864 - **A Study of the Bacteria which Survive Pasteurization.** — AYERS, S HENRY and JOHNSON, WILLIAM T. U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 161, 66 pp. Washington, March 11, 1913

After a short introduction showing the importance of the investigation in question and giving the results of previous experiments on the subject, the writers treat of the general and special object of their investigations and describe their methods of work.

Having collected information respecting the methods of pasteurization employed in the United States, the writers examined the bacterial results. They studied the quantitative reduction in the bacterial flora in connection with the temperature and the duration of the process, the effect of low temperatures on pasteurized milk, the nature and products of the surviving bacteria, both from a quantitative and qualitative point of view, the fatal temperatures for each of the different groups of bacteria, etc.

The experiments were carried out in the laboratory in such a manner as to preclude any reinfection and to ensure that the bacteria which had survived pasteurization were undoubtedly those that were not destroyed by the given temperature.

In the great number of the experiments a temperature of 145° F. for 30 minutes was used as being that most frequently employed in the United States in the Holder pasteurizing system. Nevertheless, higher temperatures were also used in order to study the variations produced in the groups of the surviving bacteria.

Raw milk contains four chief groups of bacteria : the acid, inert, alkali and peptonizing groups. The acid group is divided into two sub-groups : the acid-coagulating, which coagulates milk in less than 14 days, and the acid group, which merely produces acid and does not coagulate milk within 14 days. In raw milk the inert group is the largest. In milk pasteurized at 145° F. the great increase in the proportion of the acid-coagulating and acid group is plainly shown. The percentages of the alkali and peptonizing groups are reduced. At 160° F. the total acid group is still the largest, but the acid-coagulating sub-group is made up of bacteria which coagulate very slowly. At this temperature the alkali group is greatly reduced and the peptonizing is reduced to a minimum. At 170° F. the total acid group remains about the same, but the organisms produce acid and coagulate very slowly. The alkali group is practically destroyed, although occasionally a sample may show a fairly high percentage. At this temperature the percentage of the peptonizing group to the total bacteria begins to increase. The increase when milk is pasteurized at 180° F. is even more striking 75 per cent. of the bacteria which survive being peptonizers. None of the acid-coagulating group are found and only a small percentage of the acid group, while occasionally a few of the alkali group occur. These proportions are maintained almost constant with temperatures of 190° F. and 200 F.

The bacterial flora of pasteurized milk thus depends chiefly on the temperature of the process, and the figures given by the writers summarize in a general way the most important results of their investigation.

**865 - A Comparative Investigation of the Digestibility of the Protein of Raw Milk and of Milk Desiccated at High Temperatures.** — AVIRAGNET, DORLENCOURT, and BLOCH-MICHEL in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 15, pp. 885-887. Paris, May 2, 1913.

The digestion experiments with desiccated milk were carried out by the writers in the following manner : The milk powder was first dissolved in tepid water, after which the total nitrogen content of the solution was determined. To every 100 cc. of this solution were added 50 cc. of liquid trypsin (trypsin in chloroform water) and the mixture was equally divided between 10 Erlenmeyer flasks. The writers investigated one flask at once to ascertain the amount of diamide ( $\text{NH}_4$ ) liberated by the commencement of the digestive process ; the other nine were placed in a temperature of 37° C., after their contents had been made strongly and equally alkaline by the addition of sodium carbonate.

One flask was taken out of the thermostat every half hour for the estimation of the diamide.

The investigation of the digestibility of the raw milk protein was carried out in the same way ; the amount of nitrogen liberated during digestion was the same in each case.

From a comparison of the results of the two experiments, it is to be concluded that the proteins of desiccated milk are digested more thoroughly, although not more rapidly, than those contained in the raw product. This

difference is, in the writers' opinion, to be attributed to a molecular change due to the desiccation process.

866 - **The Effect of the Salts of the Rare Earths upon the Coagulation of Milk by Rennet.** — FROUIN, ALBERT and MERCIER, VICTOR in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 17, pp. 990-991. Paris, May 16, 1913.

In this experiment 10 cc. of milk were placed in each of a number of glass vessels with different amounts (0.1 to 1.8 cc.) of a 1 per cent. sulphate solution and kept during 10 minutes at a temperature of 38 to 40° C.; to each vessel was added the same amount of rennet, and all of them, together with controls, were placed in a thermostat for coagulation. The effects of the sulphates upon this process are shown by the following tables (which are abridged).

Amount of Sulphate in 10 cc. milk	Number of minutes required for coagulation with :					
	Cerium Sulphate	Lanthanum Sulphate	Neodymium Sulphate	Praseodymium Sulphate	Samarium Sulphate	Thorium Sulphate
0.1	20	19	16	18	19	17
0.2	19	18	16	17	18	15
0.5	14	15	14	14	14	12
1.0	9	11	10	10	10	9
1.4	7	9	7	8	8	8
1.8	5	7	6	6	7	6
	Coagulation time of control milk:					
	21	21	19	21	21	19

This table also shows that the sulphates of the rare earths hasten coagulation. According to previous experiments of the writers, the chlorides have the same effect.

867 - **The Manufacture of Cheddar Cheese from Pasteurized Milk.** — SAMOIS, J. L. and BRUEN, A. T. — *The University of Wisconsin Agricultural Experiment Station, Research Bulletin* No. 27, 248 pp. Madison, 1912.

The continued improvement of the cheese-making industry calls for more economical factory management. The writers are of opinion that large well-equipped factories should replace many of the small poorly supported factories of the present time. A new method of cheese-making is needed, by means of which milk of variable quality from many farms can be brought into practically uniform condition for cheese-making at the fac-

tory, and be made up into cheese in a uniform, routine manner daily, without variations of time or method of handling. The new method should produce cheese of greater uniformity and avoid the present common losses in yield and quality due to defective milk.

During the years 1905-1906, experimental cheese was made, omitting the starter, and in its place, adding various commercial acids to the raw milk. The method of adding acid to milk was perfected, and a two weeks' trial of the process was finally made in a commercial factory at Muscoda, Wis. It was shown that the addition of hydrochloric acid to milk is entirely practicable at cheese factories, and that the quality of the cheese is not in any way injured by such an addition; but it was also found that the quality of cheese obtained from over-ripe or tainted milk was no better than by the use of the ordinary factory methods. Therefore there was no reason for recommending the use of hydrochloric acid to cheesemakers at that time.

Most of the defects observed in cheese factory milk are of bacterial origin. In other branches of the dairy industry, pasteurization is successfully employed to overcome these faults. In 1907, a few lots of milk were pasteurized in a discontinuous pasteurizer, and then acidulated with hydrochloric acid, and the cheeses obtained were such as to demonstrate the importance of further study.

In 1908, equally good results were obtained by use of the continuous pasteurizer. Heating to 160° to 165° F. was found sufficient to check effectually bacterial action in milk for cheese-making purposes. Bacterial counts showed that over 99 per cent. of the total bacterial content of the milk was destroyed at this temperature. The use of higher temperatures was shown to be objectionable, on account of the effect on the quality of the cheese.

In 1909, cheeses were made almost daily both by the regular factory process, and by the new process from pasteurized milk. The regular milk supply was thoroughly mixed each day and divided into two lots, for the two processes. After curing, the cheeses made from pasteurized milk were found to be cleaner in flavour than the raw milk cheese and superior to it in texture. The difference was more marked the poorer the quality of the milk supply. Many of the details of the process were studied and improved.

In 1910, the making of cheese by the two methods, for comparison, was continued, and the entire output of pasteurized milk cheese was sold to retail grocers, mostly in the city of Madison, to determine how these cheeses would suit the trade. They met with a ready and continued sale. It was noticed that the yield of cheese was regularly somewhat greater by the new process than by the old.

In 1911, better facilities were provided for weighing large quantities of milk and cheese quickly and accurately, and the yields of cheese obtained from raw and pasteurized milk were carefully determined. A greater yield of cheese was always obtained from the pasteurized milk than from raw milk; so that after paraffining and curing, the gain in yield of pasteurized milk cheese over raw was 4.22 per cent. The total loss of fat in whey and drippings from vat and press, using pasteurized milk averaged 1.58 per cent.

of the weight of the cheese, or less than half of the usual loss in handling raw milk.

In addition to this saving of fat, it is found that a somewhat larger proportion of moisture is incorporated in pasteurized milk cheese than in ordinary cheese, without damage to the quality. The gain in yield of pasteurized milk cheese is therefore due partly to fat and partly to moisture.

Scores and criticisms given by competent cheese judges show that the pasteurized milk varied less in quality and averaged better by 3.7 points of total score, than the raw milk cheese made from portions of the same milk supply. The pasteurized milk cheese scored higher than the raw milk cheese in 96 per cent of all cases.

Since pasteurized milk cheeses can be cured without injury at 70° F., it is likely that in many cases the expense of cold storage for these cheeses can be avoided. Pasteurized milk cheeses can be put into cold storage at 34° F. at the age of one week, and possibly earlier, without injury. The earlier they can be put in storage, if this is done at all, the greater will be the gain in yield by the process. It is planned to study the cold storage of these cheeses further.

During 1910-1911 about 2100 dollar's worth of pasteurized milk cheese was sold to about fifty dealers, both wholesale and retail, in various large cities, from New York to San Francisco. The cheese sold readily for the ruling market prices and often above. Very few dealers offered any objection to them, and several wished to buy them regularly. In general, the cheeses passed the market without exciting special comment, selling for full price, and giving satisfaction. There appears to be no reason why pasteurized milk cheese cannot be sold regularly in any market, with entire satisfaction, excepting possibly to the limited trade that demands very high-flavoured cheese.

In the method described by the writers, a principle is applied to cheese-making which has been found useful in many other lines of manufacture: the raw material, milk, is first treated by a preliminary process to bring it into uniform condition before it enters the manufacturing process proper. Material of uniform quality, thus prepared, is made up into the finished product by a uniform routine process, and the product is more uniform in quality, has better keeping qualities, etc., than the product obtained by the older process.

The difficulties met hitherto in making American Cheddar cheese from pasteurized milk are :1) that heated milk coagulated poorly with rennet, and 2) the curd when obtained does not expel moisture precisely as raw milk curd does, this effect being more marked the higher the temperature of pasteurization. The quality and behaviour of pasteurized milk curd suggest that it lacks the acid, which is normally produced in raw milk curds by the action of bacteria on milk sugar.

The first of these difficulties, but not the second, can be overcome by adding calcium chloride solution to pasteurized milk. This method has been tried experimentally, but is not recommended for use in American cheese

factories. Both difficulties are overcome by adding an acid, preferably hydrochloric acid, to the pasteurized milk. Hydrochloric acid is normally present in the human stomach during the process of digestion, in larger proportion than that added to milk in this process of cheese-making. Further, 95 per cent. of the added acid passes out of the cheese into the whey, during the process of manufacture. On this account, no objection can be made, on sanitary grounds, to the use of this acid in the manner and for the purposes described.

Pasteurization and acidulation of milk for cheese-making appear to be complementary processes. Used together, they furnish a means for bringing milk daily into uniform condition, both as to acidity and bacterial content, for cheese-making purposes.

The acidulation of milk with hydrochloric acid after pasteurization is accomplished without difficulty or danger of curdling, by running a small stream of the acid of normal concentration, into the cooled milk, as it flows from the continuous pasteurizer into the cheese vat. One pound of normal strength acid is sufficient to raise 100 pounds of milk from 16 per cent. to 25 per cent. acidity (calculated as % of lactic acid). The amount of acid needed each day to bring the milk up to 25 per cent. acidity is read from a table, or calculated from the weight of the milk and its acidity, determined by use of Mann's acid test (titration with  $N/_{10}$  NaOH and phenolphthalein).

After the milk is pasteurized and acidulated, 75 per cent. of first-class starter is added, and the vat is heated to 85° F. It is set with rennet, using two ounces rennet per 1000 pounds of milk, so that the milk begins to curdle in seven minutes, and is cut with  $\frac{3}{8}$  inch knives in twenty-five minutes. All portions of the day's work, after adding rennet, are carried out in routine manner according to a fixed time schedule every day, so that the cheesemaker is able to calculate the exact time of day when each of the operations should be performed, and the work of making cheese is thus simplified and systematized. It is possible that the routine process here described may be varied somewhat, with advantage, at different factories.

Preliminary estimates show that the maximum extra cost of the new process may be 45 cents for 2000 pounds of milk, with many chances for reducing the cost in handling larger quantities. Because of the increased yield of cheese, the saving in rennet, and in cold storage charges, there is a saving of about \$ 2.23 in handling 2000 pounds of milk. Deducting the extra costs of making from this figure, there is a gain of  $\frac{7}{8}$  of a cent a pound on the selling price of cheese. The profits per pound will be increased where larger quantities of milk are handled and the losses in yield, quality and selling price, which factories often suffer, because of defective milk, will be avoided through pasteurization.

It should not be supposed that sanitary conditions of milk production may be neglected on a farm, as the result of using this process at the cheese factory. In all cases it is to be expected that the better the milk used, the better the quality of the cheese will be.

It is the intention of the writers to give the new process a thorough trial in different cheese factories in different localities, before recommending it for general use by cheesemakers.

868 - **The Bacteriology of Cheddar Cheese.** — HASTINGS, H. G., EVANS, ALICE C. and HART, E. B. — *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 150*, pp. 52. Washington, October 1912.

After a brief general introduction, the writers treat in a detailed manner of the action of *Bacterium lactis* and of other groups of bacteria, cocci, etc., upon Cheddar cheese.

The following is a summary of results of their investigations :

1. From the same raw materials various kinds of cheese are prepared, which differ especially in flavour. The factors that determine whether a cheese prepared from a given mass of milk, rennet and salt, is to be of one kind or another are to be found in three methods of the cheese maker, who is able to vary in one way or another the composition of the cheese, with the result that conditions are established that favour or retard the growth of the groups of micro-organisms, which must be the determining factors between different kinds of cheese.

2. The only group of bacteria found constantly in great numbers in Cheddar cheese by previous investigators is the *Bacterium lactis acidii* group. The functions of this group in Cheddar cheese, are, through their chief by-product, lactic acid :

- a) To favour the curdling of milk by rennet.
- b) To influence the shrinking of the curd and expulsion of the whey.
- c) To change the nature of the curd and cause "matting".
- d) To activate the pepsin of the rennet extract.
- e) To prevent the growth of putrefactive bacteria in the cheese.

3. It has been shown that *Bacterium lactis acidii* is able to form acid in the absence of the living cell.

4. The development of *Bacterium lactis acidii* is followed by the growth of another group of acid-forming bacteria, the *Bacillus bulgaricus* group. These attain numbers comparable with those of the first group, reaching their maximum within the first month of the ripening. Since they develop after the fermentation of the sugar, they must have some source of carbon and of energy other than milk sugar.

5. It is probable that coccus forms are constantly found in large numbers in Cheddar cheese.

869 - **Experiments in Making Camembert Cheese according to the Von Mazé Method.** — KLOSS in *Molkerei-Zeitung*, Year 27, No. 47, pp. 795-797. Hildesheim, May 30, 1913.

The writer makes a few introductory remarks regarding the different factors which hinder the normal ripening of cheeses, and then speaks of the method recommended by von Mazé of Paris for obtaining a good, thoroughly ripe, soft, French cheese. In principle, the von Mazé method consists in heating the milk to be used for cheese-making for 10 minutes at 62° C. (148. 6° F.) and subsequently cooling it to 40° C. (104° F.), after

which is added a lactic ferment cultivated according to special rules in pasteurized skimmed milk. Before the rennet is introduced a second amount of the pure culture is added, and the cheeses are sprinkled with dry cultures when in the ripening room.

The von Mazé system differs from the method usually employed in making soft cheeses, in that it always ensures a normal ripening. The writer has investigated the process and made Camembert cheese both according to the von Mazé method and according to the ordinary methods, showing thereby that there were no differences in the two kinds of cheese, except those involved in the actual manipulation. In both cases the coagulation was normal, but in that of cheeses made after the von Mazé method, the whey appeared to separate more quickly. The amount of curd was the same, but the writer noticed that cheeses made according to the usual methods ripened somewhat sooner. Only in two out of five times did the cheeses prepared by the von Mazé system show any superiority in flavour. It would thus appear that this method does not present any special advantages over that usually adopted in making Camembert cheese.

#### MEAT INDUSTRY

870 - The Reorganization of the Cattle and Meat Trade in France. — LUCAS in *Annales de la Science agronomique*, Year 30, No. 4, pp. 241-266. Paris, April 1913.

The writer first investigates the amount of the annual meat production in France and the consumption of meat in that country (1). The results are given in tabular form and according to them 20 296 394 cwt. of beef are supplied annually for home use, 3 848 638 cwt. of mutton, and 17 024 480 cwt. of pork. If to the imported meat is added also the rabbits, game, goat and horseflesh, and the amount exported subtracted, the annual consumption per head of the population is about 132 lbs.

In the following section, the writer investigates in how many of the Departments the supply meets the demand; which export and which import cattle for the butcher, and how many of such cattle are exchanged between the different Departments: Of the total number, in six the supply just meets the demand, in 50 there is a surplus, and 31 import beef; while the trade between the different Departments accounts for 550 000 head of cattle. 45 Departments import sheep, 42 export them, and 4 400 000 sheep (including 2 million lambs) are exchanged. In 42 Departments the supply of pigs exceeds the demand, and 2 200 000 head of these animals are annually on the market.

Those Departments which produce more meat than they require are chiefly situated in Central and Western France. The Northern, Eastern and Southern Departments, and also the Gironde, import cattle; some districts (Morvan, Limousin, etc.) are able to export cattle regularly throughout the year;  $\frac{2}{3}$  of the animals exported by the provinces are sent to Paris and, of these,  $\frac{2}{3}$  find their way to the La Villette market (2) and  $\frac{1}{3}$  go directly to the abattoirs. 41 per cent of the animals sent to the

(1) See No. 395, B. May 1913.

(2) See also No. 180, B. Feb. 1913.

market are again despatched from Paris and sent either abroad, or back to the provinces.

Paris is therefore the great centre of the cattle and meat trade in France, though there is a certain amount of trade in the provinces; the price of cattle, moreover, is fixed at the La Villette market.

The prices at the latter, however, are not always regulated by supply and demand, but are liable to manipulation, and as an unexpected fall in prices at La Villette affects the trade of the whole country, the unreliable nature of the market quotations is a serious disadvantage. The whole trade is also attended with great expenditure, and entails the risk of spreading disease.

The writer is therefore of opinion that the cattle and meat trade should be decentralized. This could be effected by building local abattoirs with adjoining markets in the centres of production, the cost of the erection and maintenance being partially defrayed by the local government.

871 - **The Ferment Producing Bitterness in Wines.** — VOISENET, E. Nouvelles recherches sur un ferment des vins amers. — Le ferment de l'amertume des vins consommés-t-il la crème de tartre? — *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, Nos. 15 and 18, pp. 1181-1182 and 1410-1412. Paris, April 14 and May 5, 1913.

WINE-MAKING

In his preceding communications (1) the writer demonstrated that acrolein is formed in the disease of bitterness in wines, and also shewed that a pure species of the ferment taken from a bitter wine, and cultivated in presence of glycerine, rapidly gives rise to acrolein and produces a bitter taste.

In pursuing this investigation, the writer found that this ferment, after having been sown 15 months previously in different sterilized wines, either in their natural state or partially deprived of their alcohol, developed in some cases quite rapidly and exhibited all the morphological characters of the bitter wine ferment. All the samples in which growth had taken place contained acrolein; the amount of fixed and of volatile acids had increased; the colouring matter was partly altered and precipitated, while some of the wines had a more or less pronounced bitter flavour.

The bacillus, called by the writer *Bacillus amaracrylus*, is therefore sufficient to produce the bitter disease of wines, with its organoleptic, microscopic and chemical characters.

Amongst other fermentable substances, it reacts on glycerine, transforming it partly into acrolein, and a specially unstable aldehyde, which undergoes various metamorphoses. Other products are also formed, among which are carbon dioxide, hydrogen and ethyl alcohol, the volatile acids, formic, acetic, and acrylic, as well as another acid insoluble in water, fluid at about 15°C., which appears to be caprylic acid, and finally the fixed acids, lactic and succinic. This bacillus rapidly consumes mannite and sugars, it has

(1) *Comptes Rendus*, Vol. 150, 1910, p. 1614; Vol. 151, 1910, p. 518; Vol. 153, 1911, pp. 363 and 898.

a moderate action on dextrin, and does not ferment erythrite, dulcitol, and starch. The fermentation of the sugars, saccharose, lactose, maltose, glucose, levulose and galactose, is complete in the presence of calcium carbonate. Saccharoses do not appear to be previously reduced by the ferment; and above all throughout the whole process of fermentation the cane-sugar solution does not reduce Fehling's solution.

Amongst the transformation products of mannitol and of the sugars are found those yielded by glycerine, with the exception of acrolein and its derivatives.

*Bacillus amaroxyli* seems to be inactive as regards tartaric acid and its salts, especially cream of tartar.

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## PLANT DISEASES

### GENERAL INFORMATION.

872 - **The Law of April 1329 (1913) Regarding Agricultural Pests in the Ottoman Empire.** — *Journal Officiel de l'Empire Ottoman et Archives du Ministère de l'Agriculture*, April 15, 1913.

LEGISLATIVE  
AND ADMINI-  
STRATIVE  
MEASURES

*Art. 1.* — Any person in a district observing injuries caused to plants by diseases or noxious insects, or by any other cause, known or unknown, is required to at once give notice to the local authorities, who will determine the nature of the injuries and take measures as follows:

*Art. 2.* — The nature of all plant diseases, as well of insects and other parasites which are harmful to cereal crops, plantations, and plants in general, are to be determined, together with the date of the attack, its importance, the district invaded and the kinds of plants affected. The measures to be adopted, and the time of their application, will be decided by the technical expert, who will present his report to the Vali (Governor-General of the Vilayet), to the Mutesarif (sub-Governor) or to the Kaimakam (Governor of the district). These will, in a suitable manner, acquaint those interested of the fact of the existence and of the nature of the diseases.

*Art. 3.* — Immediately upon receiving the information from the local authorities mentioned in Art. 2, landowners, farmers and all other persons enjoying the rights of pasturage and of communal forests are required to carry out the measures ordered by the Governmental authority. The control of the strict application of the methods enjoined is in the hands of the technical experts, who are not to be hindered in the discharge of their duties.

*Art. 4.* — If the injuries occur on an area which is the property of the Vilayet, or on Vacufland (land bequeathed to the church) or on State land, the necessary measures are at once carried out by the government of the Vilayet, the administration of the Vacuf, or directly by the State.

*Art. 5.* — Such persons as do not carry out the measures decreed, or carry them out in an unsatisfactory manner, and do not comply with the instructions given for their completion, are liable to a fine of from half a pound to two pounds Turkish.

*Art. 6.* — Landowners, farmers, etc., are required to at once inform the local Government of the presence of diseases, or of injurious insects. Such persons as do not comply with this order, are liable to a fine of from half a pound to two pounds Turkish. If the diseases are endemic, the statement of a villager is sufficient.

*Art. 7.* — If the measures enjoined are not carried out by the persons interested within the term fixed by the Government, the local authorities, *viz.* the Vali, the Mutesarifs, the Kaimakams, and the Director of the Commune can severally form a Commission presided over by themselves, and consisting of a member of their own administrative council, of an agriculturist, and a technical expert, who, after estimating the necessary expenses, will take the necessary measures, of which the expenses will be chargeable to the extraordinary budget of the Vilayet.

During the harvest, the sum expended will be collected with interest, according to the law of collection, by the collectors of the Ministry of Finance, and the money deposited in the local bank.

*Art. 8.* — The measures and the remedies prescribed shall be applied under the direction of the technical expert, and the outlay approved by the committee.

*Art. 9.* — The fines mentioned in the preceding article are collected in the Vilayets, Livas and Cazas by the competent council, and in the Communes, according to special arrangement by the Communal Council without having recourse to the courts of Appeal and Cassation.

*Art. 10.* — In case of refusal of payment of the adjudged fine, the competent Council, or the Communal Council, draws up a statement which is sent to the highest civil officer of the place; he reports to the examining magistrate. The examining magistrate, according to Art. 37 of the Penal Code, may substitute immediate imprisonment for the fine.

*Art. 11.* — The ministries of the Interior, of Justice, of Commerce, and of Agriculture are charged with the carrying into effect of this law.

*Art. 12.* — This law comes into force on the date of its publication.

873 — **Decree for the Protection of the French Colonies and Protectorates from the Propagation of Plant Diseases.** — *Journal Officiel de la République française*, Year 45, No. 148, p. 4128. Paris, May 12-14, 1913.

Under date of May 6, 1913, the President of the French Republic decreed as follows :

*Art. 1.* — In view of hindering the propagation of plant diseases due to parasitic animals and plants or to worms or to non-parasitic insects, the Colonial Minister may by special orders, setting forth the disease and the plants susceptible to its attack, forbid the following articles being imported into colonies, or protectorates, other than Algeria, Tunisia and Morocco :

- 1) Plants subject to the said disease.
- 2) All other plants with which the disease might be transported.
- 3) Soil or composts capable of containing these parasites, worms or non-parasitic insects at any stage of their development.

The plants, soils or composts which might serve as a vehicle for this disease are determined, in the event of its occurrence, by decrees of the Governors General and Governors. These decrees are immediately published. The Governors General and Governors inform the Colonial Minister of the fact by telegraph. The entry may also be prohibited of cases, sacks or

packing materials which have served in the transport of the prohibited plants, soil and composts.

*Art. 2.* — In default of any existing prohibition by virtue of the preceding article, the Colonial Minister can, by special decree, determine the conditions of the entrance and circulation in the Colonies and Protectorates of the plants and objects mentioned in the said article. He also fixes the conditions under which the branches, leaves, fruits and débris of the said plants may enter and circulate in the colonies and Protectorates.

*Art. 3.* — Any person infringing the measures of the Colonial Minister regarding the execution of the first and second articles of the present decree is liable to a fine of from 50 to 500 francs (£ 2 to £ 20).

*Art. 4.* — Persons who, by means of any fraudulent device, shall introduce into the Colonies or Protectorates dependent on the Colonial Office plants or articles of which the introduction has been prohibited by the Colonial Minister, in accordance with art. 1. of the present decree, are liable to a term of imprisonment varying from one to fifteen months and a fine of from 50 to 500 francs, or to one of these penalties singly.

*Art. 5.* — The penalties set forth in the two preceding articles are doubled in the case of a second offence. The offence is regarded as a second offence if, during the twelve preceding months, a first sentence has been passed upon an offender according to the present decree.

*Art. 6.* — If extenuating circumstances can be proved, the courts are empowered, even in the case of a second offence, to reduce the term of imprisonment to less than one month and the fine to below 50 francs, provided the penalties are not made less than the simple police fine.

*Art. 7.* — The decree of July 26, 1911 (1), is abrogated.

*Art. 8.* — The Colonial Minister and the Keeper of the Seals, Minister of Justice, are charged, each according to his powers, with the execution of the present decree, which will be published in the *Journal officiel* of the French Republic and inserted in the *Bulletin des Lois* and the *Bulletin officiel* of the Colonial Ministry.

874 — **Proclamation on Plant Protection in Nyassaland.** — The Plant Protection Ordinance, 1912. Proclamation. No. 8 of 1912. — *The Nyassaland Government Gazette*, 287: Vol. XX, No. 1, pp. 3-4. Zomba, Jan. 31, 1913.

Whereas by Section 3 of "The Plants Protection Ordinance, 1912," it is provided that the Governor in Council may by Proclamation to be published in the *Gazette* absolutely or conditionally prohibit the importation directly or indirectly from any country or place named in such Proclamation of any plant or any earth or soil or any article packed therewith or any package or other article or thing which in the opinion of the Governor in Council is likely to be a means of introducing any plant disease into the Protectorate.

And whereas it has been made to appear to me that the importation

(1) See No. 2378, B. July 1911.

(Ed.).

of cotton plants with the following exceptions should be absolutely prohibited :

Exceptions :

- 1) Cotton plants grown in Egypt.
- 2) Cotton plants imported for experimental purposes by the Director of Agriculture and packed in double bags or tins.

And Whereas it has been further made to appear to me that all plants permitted to be imported should be imported subject to certain conditions :

Now therefore by virtue of the powers in me as Acting Governor in Council vested as aforesaid I DO HEREBY declare and proclaim that the importation of cotton plants with the exceptions as aforesaid shall be and is HEREBY absolutely prohibited.

And Further that the importation of all plants permitted to be imported shall be imported subject to the following conditions :

1. Every package containing plants imported into the Protectorate through the medium of the Post shall contain a statement containing the full names of the kind and variety, the country of origin, and the name and address of the person or firm supplying such plants together with any certificate which may be prescribed by Schedules A or B. Such package shall be delivered by the Postal Department to the Agricultural Department, Zomba, for inspection, and disinfection, if necessary. Such package shall, if in order, be delivered to the Post Office to be forwarded to the address without further postal charge. Any package of plants which does not contain the requisite statement and certificate shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine.

2. When plants are intended to be imported otherwise than through the medium of the Post, a statement containing the full names and the kind and variety, the country of origin and the name and address of the person or firm supplying such plants together with any certificate which may be prescribed by Schedules A or B shall be posted to the Comptroller of Customs. Such statement and certificate shall be despatched by the consigner in sufficient time to enable it to reach the Comptroller of Customs one month in advance of the consignment. Plants which reach the Port of Entry, for which the necessary statement and certificate have not been received, shall be detained, pending the receipt of the statement and certificate as aforesaid, and if such are not received within one month subsequent to the arrival of the plants the whole consignment shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine. When plants are imported by persons entering the Protectorate, the importer shall declare the same to the Customs Officer, giving the information required above, and producing the certificate which may be prescribed by Schedules A or B. In the event of the statement and certificate being in order all plants shall be disinfected, if considered necessary by the Agricultural Authority at the Port of Entry, and allowed to proceed. Should any statement or certificate prove to be incorrect, the whole consignment shall be liable to be confiscated.

3. All plants shall be securely packed and should any package become so damaged in the course of transit as to render it possible that any plant may escape therefrom, such package and any plant therein or therefrom, may at the discretion of the Agricultural Authority be confiscated.

The following Proclamations are revoked :

Proclamation contained in *Gazette* Notice No. 49 of 1909.

Proclamation contained in *Gazette* Notice No. 79 of 1909.

Proclamation contained in *Gazette* Notice No. 131 of 1909.

#### SCHEDULE A.

The importation of plants of the following kinds shall be accompanied by a certificate from the official Agricultural Authority of the countries from which the plants originated to the effect that they have been grown in areas known to be free from diseases or pests which characteristically attack such plants :

Rubber of all varieties	}	from all countries.
Cacao . . . . .		
Cocoanuts . . . . .		
Rice . . . . .		
Tobacco . . . . .		
Potatoes . . . . .		

#### SCHEDULE B.

The importation of plants of the following kinds shall be subject to the permission of the Agricultural Authority being first had and obtained.

Coffee . . . . .	}	from all countries.
Tea . . . . .		

875 - **Regulations on Cotton Growing in Nyasaland.** - The Cotton Ordinance, 1910. Rules. *The Nyasaland Government Gazette*, 287: Vol. XX, No. 1, pp. 5-6. Zomba, Jan. 31, 1913.

1. Every landowner and person planting cotton in the Protectorate shall uproot and burn all cotton bushes on his land or planted by him before the last day of October next following the date of planting of such bushes. Provided that this Rule shall not apply to the Lower Shire, Ruw and West Shire Districts.

2. Every landowner and person planting cotton in the Lower Shire, Ruw and West Shire Districts shall uproot and burn all cotton bushes on his land or planted by him in these Districts before the last day of December next following the date of planting of such bushes.

3. Any bushes not uprooted and burnt in accordance with these Rules may be uprooted and burnt by order of the Director of Agriculture or of the District Resident. In the event of this being done the landowner and the person who planted the bushes shall be jointly and severally liable for any expense occasioned by such uprooting and burning in addition to their liability to the penalties prescribed for a breach of the Ordinance.

*Cotton to be ginned in the Protectorate.* — 4. All native grown cotton produced upon Crown lands from seed issued by Government shall be ginned in the Protectorate.

*Reservation of seed to Government.* — 5. All cotton seed issued by Government to natives is issued subject to the condition that Government retains the right to any seed obtained from the crop which is the produce of the seed issued. Every licensee purchasing native grown cotton produced upon Crown lands from seed issued by Government, before selling, giving or otherwise disposing of such seed after ginning shall obtain a certificate from the Director of Agriculture that such seed is not required by Government, and if the Director of Agriculture shall intimate that such seed or any part thereof is required by Government the licensee shall hold the quantity specified at the disposal of Government.

*Approval of Director of Agriculture.* — 6. No cotton seed shall be issued to natives until it has been approved by the Director of Agriculture.

*Authority for distribution of seed.* — 7. No person except a person authorized by the Governor, shall distribute seed to natives for cultivation on Crown lands. Applications for such authority shall be made in the first instance to the Director of Agriculture.

*Licence to purchase.* — 8. No person shall purchase native grown cotton being the production of seed distributed for cultivation on Crown lands, unless he shall previously have been licensed so to do under these Rules.

*Form of licence.* — 9. A licence shall be in the form prescribed by the Governor and shall expire on the thirty-first day of March next following the date of issue. Every such licence shall be obtainable from the District Resident of the District in which the purchase is to be made.

*Duty of licence.* — 10. The duty chargeable on a licence shall be ten shillings.

*Place of purchase.* — 11. No licence shall authorize a licensee to purchase native grown cotton in a place other than the place stated in the licence.

*Establishment of markets.* — 12. For the purpose of the sale of native grown cotton, markets shall be established by Government in native cotton growing districts.

*Market tolls.* — 13. Purchasers of native grown cotton shall pay market tolls at the rate of 3 *d.* per cwt. of seed cotton purchased. Such tolls shall be paid to the District Resident of the District to which his licence applies concurrently with the submission of the monthly return referred to in Rule 14 hereof.

*Monthly returns.* — 14. Every licensee shall on the last day of each month make a return to the District Resident of the District to which his licence applies showing the total weight of native grown cotton from Crown lands purchased by him during the month and the price which he paid for such cotton.

*Inspection of cotton purchased.* — 15. All native grown cotton from Crown lands purchased by a licensee may be inspected at any reasonable time by the district Resident, the Director of Agriculture, or by any officer of the Agricultural Department or by any officer appointed by the Governor, and

such licensee shall give all such information as to the place where and the person by whom such cotton was grown or sold or ginned or otherwise as the said inspecting officer shall require and the licensee be able to afford.

*Cancellation of licence.* — 16. A licence may be cancelled on conviction of the licensee of a breach of any of these Rules.

A new licence shall not be issued to any person whose licence has been so cancelled except by the express authority of the Governor.

*Penalty for breach of Rules.* — 17. Any person committing a breach of any of these Rules shall be liable on conviction to a fine not exceeding five pounds or in default of payment to imprisonment for a term not exceeding one month.

*Repeal.* — 18. The following Rules are hereby repealed :

(1) Rules made the 20th December, 1910, and published in the *Gazette* of the 31st December, 1910.

(2) Rules made the 28th June, 1911, and published in the *Gazette* of the 30th June, 1911.

*Rules subject to disallowance.* — 19. These Rules are subject to disallowance by the Secretary of State.

## DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

876 — **Physiopathological Observations on the Stigma of the Olive Flower.** — PETRI, L. in *Memorie della R. Accademia di Patologia Vegetale, Roma*, IV, pp. 139-160, figs. 1-7. Rome, 1913.

The papillae of the stigma of the flower of the olive are secretory organs. It is the lamella below the cuticle which becomes gelatinous, raising and bursting the cuticle.

The microchemical reactions of this lamella show that it consists of a hemi-cellulose insoluble in cuprammonium solution, not coloured blue by iodised potassium iodide, or by zinc chloride-iodide reagent. It is soluble in boiling 20 per cent. potash and it swells and is easily hydrolyzed on the addition of dilute mineral acids.

The pollen-tube finds in this mucilage an excellent substratum for its development, and receives from it a strong chaemotropic stimulus. A further stimulating action appears, on the other hand, to be exercised by the pollen tube on the cells of the conducting tissue, and to the enzyme action of these is due, as in the case of the papillae, a partial chemical modification of their walls, which are largely of hemi-cellulose.

This vegetative stimulating action of the pollen-tube is in every case limited to the stigma; after flowering, the ovary may continue to grow for many days, as may also the ovules, independently of pollinisation. This growth is in strict connection with the vegetative condition of the whole plant.

DISEASES  
NOT DUE TO  
PARASITES  
AND OF  
UNKNOWN  
ORIGIN

Amongst the external causes which may provoke alteration in the stigmatic papillae and bring about their death, are rain and mist, both of which act by wetting the stigma.

The death of the stigmatic papillae is due to the arrest, or excessive reduction, of the activity of the functions of respiration, transpiration and assimilation. These conditions bring about an accumulation of oxalic acid exceeding the amount which can be tolerated by the protoplasm.

## BACTERIAL AND FUNGOID DISEASES.

### FUNGI

877 - **Work of the Laboratory for Botanical Research and Plant Diseases at the Royal Imperial Institute of Vine and Fruit Cultivation at Klosterneuburg, Austria.** — Communicated by Prof. L. LINSBAUER to the *International Institute of Agriculture*.

One of the principal aims of the Laboratory has been to study vine diseases not only with reference to parasites, but specially on the lines of investigation of the physiology of disease; its work should therefore be judged from this point of view.

In this paper a short description is given of some of these physiological investigations, which naturally extend over a considerable period of time, and as many of them are still incomplete, the following lines should be regarded in the light of a programme.

*Pseudopeziza tracheiphila* (« Rote Brenner ») was observed in dry seasons on European vines and also on American vines and on hybrids. It occurred in the typical form, fungus mycelium being in all cases present. The following varieties of vines were attacked: Berlandieri, Monticola, Riparia Portalis, Solonis, Riparia X Rupestris, Mourvèdre-Rupestris, Goethe 9, Schwarzmänn-hybrid.

Cuttings of vines affected by this disease were grown under glass and kept as dry as possible in order to determine whether the infection can be conveyed to cuttings by the mycelium entering the stem of the vine. In spite of cultivation for several years in dry air, without dew or rain, and with the scantiest watering, only a single spot due to the fungus was seen. The occurrence of the latter is therefore due in every case to reinfection.

The "Droah" (1) is a vine disease occurring in Lower Austria and almost exclusively in high situations; it is characterized by hindering of growth of the internodes and leaves, and dropping of the flowers. Investigations on the spot lead to the supposition that we have here to do with a manifestation due to winter drought. The disease is of great interest, because the flowers are not all hermaphrodite, but some male and also intermediate (in Rathay's sense) flowers occur. It is proposed to obtain similar changes in the flowers artificially by means of different cultural conditions.

(1) See also No. 288, B. Jan. 1911.

(Ed.).

Further, the disease has suggested the study of desiccation phenomena in vines. These investigations are at present not concluded. A few preliminary observations suggest that vines only shoot when their water content reaches a fixed average (in a preliminary series of experiments between 31 and 39 per cent.), while with a higher or lower water content no shoots are produced. Whether "Droah" symptoms can be artificially produced by want of water is at present unknown. The relation between "Droah" and the leaf-curl ("Kräuselkrankheit") due to mites has yet to be ascertained.

Another problem is afforded by the diseases of grafts, which are chiefly connected with the question of wood ripeness. These maladies are to be made the subject of investigations, all the more because two points seem to have been shown by the discussion of the views hitherto obtaining respecting wood ripeness.

Firstly, the condition in which we find a so-called "ripe" shoot depends upon unknown causes, which are quite different from those giving rise to the symptoms characteristic of ripe wood. Again while "ripeness of wood" is a useful, practical and pertinent expression, it does not convey a single idea with sharply defined limits.

The question of the entry of the spores of *Plasmopara* into the leaves of the vine, which has lately been answered by Müller-Thurgau (1) in the manner we know, leads to a closer investigation of the foliage of trees as regards the opening and shutting of their stomata. Molisch's infiltration method could be used for this purpose.

Other questions of a purely physiological nature arise from these investigations, which we have cursorily described. They are all based upon the principle which we mentioned at first, viz. that the condition of a diseased vine can only be rationally judged when the physiological state of a healthy plant is taken as a basis for comparison.

878 - A Contribution to the Mycological Flora of East Russia. — NAUMOFF, N. Travaux de l'Institut de Pathologie végétale de St.-Petersbourg. Matériaux pour la Flore mycologique de la Russie. — *Bulletin trimestriel de la Société mycologique de France* Vol. XXIX, Part 2, pp. 273-278, fig. XIII. Paris, 1913.

The writer is about to publish the complete list of species collected in East Russia during the summer of 1912, and in the meantime, describes the three following species, which he considers to be new to science: *Bremia graminicola*, on the living leaves of *Arrhaxon ciliaris* Beauv.; *Cicinobolus bremiphagus*, the pycnidia of which were closely attached to the fruiting organs (conidiophores) of the preceding species; and *Rhodoseptoria ussuriensis*, which destroys the leaves and fruit of a plum tree known popularly as the "Manchurian Plum".

- 879 - **On the Propagation of Rusts among the Gramineae.** — BEAUVIER, J. in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 18 pp. 1391-1394 Paris, May 15, 1913.

The writer, in his researches on the propagation of rusts in the neighbourhood of Lyons, has frequently recorded the presence of the resting or reproductive organs of these fungi (mycelium, uredospores and teleutospores) inside the caryopses of cultivated Gramineae (wheat, oats, barley), or of wild species (*Bromus mollis*, *Brachypodium pinnatum*, *Agropyron caninum*, *A. repens*).

The writer considers that the observations he has so far made are insufficient to permit of his expressing any opinion as to the power of these organs to transmit rusts, and therefore proposes to continue his researches and to supplement them by practical experiment.

- 880 - **The Biology of *Cycloconium oleaginum*.** — PETRI, L. *Studi sulle malattie dell'olivo III. Alcune ricerche sulla Biologia del *Cycloconium oleaginum* Cast.* - *Memorie della R. Stazione di Patologia vegetale*, Roma, 1913, p. 37 figs. Rome, 1913.

The observations made by the writer refer to four principal questions, some of which have already been dealt with by other investigators: a) Cultures of *Cycloconium oleaginum* ("olive pox" or "peacock-eye") on artificial nutritive media; b) the germinating conditions of the conidia; c) the enzyme action of the fungus upon the cuticle of the olive leaves; d) the localization and development of the disease with regard to the condition of receptivity of the leaves.

The researches, partly carried out since 1905, have shown in the first place that *Cycloconium* can be grown saprophytically. In cultures it forms chlamydospores and microsclerotia, and only on an acid substratum does it give rise to conidia. A temperature of from 30° to 32° C. prevents the germination of the latter and also hinders the development of the cultures; the lowest temperature which permits of the germination of the conidia is 2° C., but the mycelium is very resistant to cold (-15° C.). Germination does not take place in water rendered alkaline by the addition of 5 per cent. of sodium carbonate or containing 3 per cent. of tartaric acid. It is also hindered by mercuric chloride at a concentration of 1:500 000, by: silver nitrate (1:35 000), gold chloride (1:30 000), copper sulphate (1:30 000). The resistance to toxic action depends directly upon the reserve substances present in the conidia. The useful action of calcium polysulphides is only temporary; sulphur does not hinder germination.

Two enzymes were isolated from the mycelia of the cultures, the one a pectin, and the other a lipase; the latter attacks the waxy and fatty substances of the cuticle.

Neither in the cultures nor in the leaves were toxic substances elaborated by the mycelium.

The conditions of receptivity of the leaves are governed principally by the richness in pectic substances shown by the cuticularized layers of the external walls of the epidermis and by their minimum cuticularization. This chemical constitution of the membrane depends upon the local conditions of the cells (due to disturbance of some enzyme function), which in

their turn depend on pathological vegetative conditions. In the wild olive tree the slight development of the cuticularized layer, which in the cultivated variety is more or less rich in pectic substances, represents a condition of constitutional resistance which is capable of modification by means of cultivation. *Cyloconium* does not find conditions suitable for its development on leaves which are about to fall. The nutrition of the intercuticular mycelium takes place at the expense of the cuticularized layers of the membrane, and at that of the carbo-hydrates and soluble nitrogenous compounds present in the epidermal cells. The germination of the conidia at low temperatures, and the physiological condition of the leaves in winter, render infection at that season possible, especially in southern and littoral districts.

88r - Connection Between the Acidity of the Cell Sap and Rust Resistance in Wheat. — COMES, ORAZIO. Della resistenza dei frumenti alle ruggini. Stato attuale della questione e provvedimenti. — *Atti del R. Istituto d'Incoraggiamento di Napoli*, Series VI, Vol. IX, p. 22, Naples, 1913.

RESISTANT  
PLANTS

The present work deals with the immunity and susceptibility of different varieties of wheat to the attacks of rusts.

The writer first gives a summary of the different results obtained by the various investigators on the subject, and then passes on to the fact, which is well known in practice and has been confirmed by experiment, though no plausible reason has been put forward to explain it, that nitrogenous fertilizers weaken the resistance of wheat to the attacks of rusts.

In a preceding work devoted to the effects of manuring, the writer has shown that though fertilizers stimulate the cells of the plants and cause them to increase both in size and in number, with a simultaneous decrease in thickness of the walls, on the other hand they diminish the acidity of the cell sap; that is to say that the acidity of the cell sap in various plants which are unmanured, badly cultivated, or in the wild state, will always be greater than that in the corresponding organs of manured plants.

With the use of a nitrogenous fertilizer, not only is the size of the organs increased, but a considerable growth of parenchymatous and chlorophyll-containing tissues is obtained. This entails a high starch production and a consequent increase in reducing sugars which constitute its mobile form. But with the increase of reducing sugars in the sap, the amount of organic acids decreases, the different organs lose their acid taste (fruit, leaves etc.), and the gain in sugar is accompanied by a loss of hardness.

It has further been ascertained that liquids containing sugar form the best media for the development of mycelia. Hence it follows that the organs of plants treated with nitrogenous fertilizers, being richer in sugar, are more liable to the attacks of parasitic fungi than the corresponding organs of plants which have not been manured, or have remained uncultivated. If therefore the susceptibility, and thereby the resistance, of an organ to a parasite varies according to the relative proportions of reducing sugars and acids present in the cell sap it follows that the bio-chemical factor (admitted but undetermined by investigators) which constitutes the means of resistance of an organ to disease may be estimated from the acidity of the cell sap.

The writer is convinced that this acidity is the factor which enables plants to resist parasitic fungi, and hesitates that if wild plants are not only more resistant to parasites, but also to injury and attack by physical agents, this circumstance is due rather to the greater acidity of their cell sap than to the greater density and compactness of their tissues. If the so-called hard wheats (*Triticum spelta*, *T. polonicum*, *T. durum*, *T. turgidum* and the races related to them) are more resistant than all the so-called soft wheats, this is due to the fact that the production of starch (and therefore of sugars) differs in the two groups: in the former, that of the hard wheats, where the caryopsis is rich in gluten and poor in starch, the sugar production is relatively less than in the case of soft wheats, which have a caryopsis poor in gluten and rich in starch. Therefore with the increase of starch in the grain the susceptibility of the latter to rust attacks should increase.

The power of the plants to produce sap more or less rich in sugars or in acid must be a specific character and therefore hereditary. Cultivation in general, and the application of manures in particular, exercises an improving influence on the plant, and the degree of improvement attained by the plant is largely controlled by the general conditions of cultivation to which it is subjected. Therefore, by means of domesticating it in different localities, one wild stock will produce different races, and their degree of susceptibility to disease will be intimately connected with the degree of improvement attained by each race in a given environment. And it will always be found that the organs of the plants which have been most improved are richer in sugars and poorer in acids than the corresponding parts of those whose improvement has not been carried so far.

Together with the acidity factor it has been recorded that a given race which is resistant in one region retains and frequently increases this characteristic when transferred to a colder region, whether the latter be more northerly or merely at a higher altitude, and *vice versa* loses its resistance in warmer regions. In this connection, it is sufficient to observe what occurs in the case of the vine. The acidity of the wine increases, and its sugar content, and consequently also its alcohol content, decrease gradually as the vineyards rise on the sides of the hills or spread into the more northern districts; and, *vice versa*, the acidity decreases and the sugar and alcohol content increase as the vineyards descend into more southern climes. Consequently a given variety which is resistant in cold or high regions will also lose this quality when brought into warmer localities, and according to the author, the variations in its power of resistance will always be correlated with its sugar and acid content.

The chemical analyses of American vines have confirmed the acidity principle advocated by the writer (1) so far as their resistance to phylloxera is concerned, and the same has been observed in the case of Rieti wheat, which is celebrated for its resistance to rust.

The first tests made at the Royal Station for Cereal Cultivation at Rieti proved that the sap of this variety was actually more acid than that

(1) See in this connection *B. Dec.* 1910, p. 386

(Ed.).

of other kinds grown under similar conditions. Comparative tests were carried out at Rieti and in a much warmer locality (the plain of Apulia) which led to the following conclusions:

a) In Rieti wheat the cell sap is more acid than that of other varieties of wheat grown under similar conditions in the districts of Rieti and Foggia.

b) The acidity of the cell sap, though maintaining almost the same order, decreases in all varieties grown in the plain of Apulia, i. e. in a warmer place than Rieti.

Taking these facts into consideration, the agriculturist should confine himself to biological means in order to increase the resistance of improved plants, i. e. to hybridisation and selection. By these means only can he discover the most resistant varieties for a given district. Further, in order not to diminish the plants' power of resistance to parasites, it is necessary to remember that the application of nitrogenous manures (especially dung), while being the most direct method of improving the crop by stimulating the development of parenchymatous tissues, at the same time increases the sugar content of the sap and thus renders the plants an easier prey to parasites. In order to preserve the highest degree of acidity in the cell sap and at the same time to maintain the fertility of the soil, nitrogenous manures should be avoided, and phosphatic fertilizers, especially superphosphates, should be used in their place.

882 - Methods of Obtaining "Wetting" Fungicides (1). — VERMOREL, V. and DANTONY, E. Sur les bouillies fongicides mouillantes. — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, First Half-Year, Vol. 156, No. 19 (May 13, 1913), pp. 1475-1476. Paris, 1913.

MEANS OF  
PREVENTION  
AND CONTROL

The researches of the writers have proved that all cupric washes can be easily and economically rendered adherent, in the case of vines, by adding a) gelatine (3 to 8 oz. per 100 gallons) to acid washes, or b) an equal amount of casein, dissolved in milk of lime, in the case of washes with an alkaline reaction.

883 - Anthracnose of Sisal Hemp. — SHAW, F. J. F. in *The Agricultural Journal of India*, Vol. VIII, Part I, pp. 66-68, plates XVI-XVIII. Calcutta-London, 1913.

BACTERIAL  
AND FUNGOID  
DISEASES  
OF VARIOUS  
CROPS

The writer records that in various parts of India the leaves of *Agave rigida* var. *Sisalana* (the well known textile plant) have been extensively and seriously injured by a disease which he calls "Anthracnose of Sisal Hemp." According to investigations conducted on the spot, the disease is due to *Colletotrichum Agave*, described for the first time by Cavara in 1892, as occurring on the leaves of species of *Agave* in Lombardy.

Using infected material from Dacca, Mr. Shaw obtained pure cultures of the fungus and succeeded in reproducing the disease artificially. The *Colletotrichum* in question proved to be a wound parasite, and as it is not unusual to find longitudinal cracks in the leaves of *Agaves*, especially after

a period of hot dry weather, it is easy to understand that infection might take place through such breaks in the superficial tissue.

Collecting and burning diseased leaves and spraying with Bordeaux mixture are measures advocated by the writer for checking the disease.

884 - **Lime-Sulphur Wash for American Gooseberry Mildew (*Sphærotheca mors-uvæ*).** — SALMON, E. S. and WRIGHT, C. W. B. in *The Journal of the Board of Agriculture*, Vol. XIX, No. 12, pp. 994-1004. London, 1913.

Different varieties of gooseberries differ to a marked degree as regards the susceptibility of the foliage to injury from the lime-sulphur wash. With some varieties, e. g. May Duke, it is possible to spray throughout the season with lime-sulphur sufficiently strong (1.01 sp. gr.) to prevent the attacks of American gooseberry mildew without causing any injury to the foliage; it is probable that, at least with some varieties, the young foliage will prove resistant to injury from the lime-sulphur wash at the beginning of the season (May) while showing susceptibility later in the year. This is of practical importance in controlling the disease, since it is also in May and the early part of June that spraying will prove most efficacious by preventing the first infection of the season due to the germinating ascospores and the subsequent rapid spread of the parasite by means of conidia.

Under ordinary summer weather conditions, the strength of the lime-sulphur wash should be as follows:

For Whinham's Industry, Rifleman, Warrington and May Duke: 1.01 sp. gr.

For Lancashire Lad: 1.005 sp. gr.

For Crown Bob: 1.005 sp. gr. used early in the season only, as later it may cause some injury.

For Berry's Early: 1.005 sp. gr. early in the season and when the bushes are more or less shaded; later in the season the wash damages the foliage even when used at lower concentrations.

Valentine's Seedling and Yellow Rough varieties show so marked a susceptibility to injury that the lime-sulphur wash should not be used on them at all. Until further experiments have been carried out the half-strength wash (1.005 sp. gr.) should be used and the spraying done on an experimental scale.

855 - **Fungus Diseases of *Hevea brasiliensis* and *Butyrospermum Parkii*.** — GRIFFON, ED. and MAURLANC, A. Sur quelques champignons parasites des plantes. — *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 2, pp. 244-249, figs. 1-2, plates IV. Paris, 1913.

P. Hennings described and illustrated (1904) under the name *Dothidella Ulei* a fungus living on the leaves of *Hevea brasiliensis* (the rubber plant) collected in the upper valley of the Amazon. The writers have recently discovered the same species at the mouth of this river. On examining the material, they did not find the imperfect form described by Hennings under the name *Aposphaeria Ulei* and regarded by him as belonging to the cycle of development of *Dothidella*, an opinion which the

writers do not share. They observed some stromae containing both asci (generally immature) and spermatia unlike those of *Aposphaeria* and finally found, on the lower surfaces of some leaves, a coridial form of the *Scolecotrichum* type which was without doubt connected with *Dothidella*. The investigators consider that the latter, in its different fruiting forms, may be a leaf parasite of *Hevea*, but not the cause of any serious disease. On adult trees the injury is practically negligible; plants in a nursery, such as formed the subjects of investigation, may, on the other hand, suffer considerably from the attacks of this cryptogam.

The writers then describe a disease which affects another useful tree, *Butyrospermum Parkii* (1), concerning the cryptogamic diseases of which there was, so far, apparently no information. They observed in the first place upon infected leaves gathered in the neighbourhood of Kulikoro (Upper Senegal and Niger), a fungus which they consider to be new and describe under the name of *Fusicladium Butyrospermi*. Finally, on a few leaves they discovered old and completely empty conceptacles (pycnidia or perithecia), and in addition to these the fructiferous organs of a *Pestalozzia*, which they describe as new (*P. heterospora*). The latter had apparently developed saprophytically on the patches produced by the first fungus. The writers have no information as to the conditions under which the two above-mentioned diseases were developed nor as to the injury (probably insignificant) which they caused.

886 - *Asterina* sp. on the Leaves of Maté in Argentina. — LENDNER, A. Un champignon epiphyllé des feuilles d'*Ilex paraguariensis*. — *Bulletin de la Société botanique de Genève*, Second Series, Vol. II, No. 1, pp. 34-35, fig. 3. Geneva, 1913.

In the summer of 1912, the writer received from Rosario (Argentina) some leaves of Maté (*Ilex paraguariensis*) on both surfaces of which were black spots due to the presence of a superficial fungus; this was a species of *Asterina* (Perisporiaceae). It appears only here and there in the Maté plantations, but covers all the leaves of any tree which it attacks. On the lower surface of the leaf the fungus forms a somewhat regular black network, while on the upper side it appears under the form of black spots 1 to 2 mm. in diameter. The disease does not appear to harm the leaves, but its presence nevertheless detracts from the value of the product.

887 - *Endothia pseudoradicalis* n. sp. on the Chestnut in Italy. PETRI, L. Sopra una nuova specie di *Endothia*, *E. pseudoradicalis* — *Rendiconti delle sedute della Reale Accademia dei Lincei. Classe di Scienze fisiche, matematiche e naturali*, 1913, Vol. XXII, First Half-year, Part 9, pp. 653-658, figs. Rome, 1913.

In the early part of 1912, at Torcigliano di Pescaglia (Lucca), the writer found at the base of some chestnut poles 5 or 6 years old numerous fructifications of an *Endothia* which he considers new, and of which he gives only a description for systematic purposes, naming it *E. pseudoradicalis*. The

(1) For the uses and products of this plant, see No. 1296, B. Sept. 1912.

chestnut poles in question had sprung from the stump of a tree which had been felled in the hope of saving it from the ink disease.

*E. pseudoradicalis* shows the closest affinity to *E. virginiana* And., but differs from the latter in the nature of the walls of the perithecium, which more closely resemble those of *E. parasitica* (Murr.) And.

## PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC  
AND OTHER  
INJURIOUS  
FLOWERING  
PLANTS

888 - **Wintering of Dodder in the Vegetative State.** — MORETTINI, A. in *L'Italia Agricola*, Year L, No. 10, pp. 245-248, Plate. Piacenza, May 30, 1913.

Lazionow in one of his recent works (1) has stated that dodder (*Cuscuta*) is an annual plant; the opinion of other investigators is divided, some maintaining that it cannot survive the winter, while others doubt this assertion. On the other hand, investigations made in Italy by Benvenuti (1844) and Peglion (1909) showed that dodder in a vegetative condition can resist a winter temperature of 5° and 7° C. and grow luxuriantly on the return of spring.

The writer, who is convinced that the question is of great importance with regard to the means adopted for destroying the parasite, considered that in view of the uncertainty which prevailed on the subject, it would be useful to see how this plant behaved under the climatic conditions of Umbria.

The experiments were begun in the summer of 1912 in the experimental field of the Royal Institute of Experimental Agriculture at Perugia on a three-year-old field of lucerne in excellent condition of vegetation and from which all possibility of dodder infection by means of seed was excluded. The results (in March 1913) showed that, as had already been shown by Benvenuti and Peglion, this parasite is capable of wintering in a vegetative condition, i. e. can reproduce itself from year to year without necessarily forming seeds. This proof should suffice to convince farmers that if a crop is infected in the summer, unless measures are taken for the destruction of both the host-plant and the parasite, the latter will preserve its vitality throughout the succeeding winter and subsequently develop luxuriantly. Repressive measures carried out in winter are thus advisable in the case of summer and autumn invasion of the pest; these consist in cutting off the infected plants 1 to 3 cm. below the surface of the soil either with a spade or, better still, with a sharp hoe. All the cut plants should be burnt on the spot, or if removed elsewhere for destruction, this should be done with the greatest care. It is best to wait until February or the beginning of March before beginning the winter treatment, but it is necessary to carry it out before working the field in any way, and before the host-plants begin to show leaf, as the presence of young shoots makes it more difficult to distinguish the plants attacked by the dodder.

(1) See No. 75, B. Jan. 1913.

(Ed.).

889 - ***Senecio vernalis*, a Troublesome Weed in the Rhenish Palatinate.** — Wüstr. Das Frühlingskruzkrant (*Senecio vernalis*) in der Pfalz. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, Part 5, pp. 70-71. Stuttgart, May 1913.

This groundsel made its appearance in the eastern provinces of Germany towards the beginning of last century — it was first observed in Silesia (1822) — and very soon spread to nearly all the German States. It has a vegetative period of two years, and as it passes the winter as a rosette is very difficult to eradicate from any spot where it has established itself.

It was recorded as occurring in the Palatinate as far back as 1906, where it made its appearance in the district of Ludwigshafen, whence it spread to a large part of the surrounding country. In 1908 it was found between Hassloch and Böhl growing in a field of lucerne.

Wherever it has not been kept in control by severe repressive measures, this weed has spread to such an extent that it has got quite out of hand, and it is no uncommon thing to see whole clover fields transformed into a sheet of yellow owing to the large numbers of plants present. It also invades the woods whenever it finds the conditions necessary for its existence.

The writer also maintains that, contrary to general belief, this weed is also to be feared in clover leys on arable land, since according to his investigations the seeds of *Senecio vernalis* retain their germinative power for some years. He therefore recommends the immediate adoption of repressive measures.

## INSECT PESTS.

890 - **The Formation of a German Society of Applied Entomology.** — *Communicated to the International Institute of Agriculture.*

GENERALITIES

During the meeting of the German Zoological Society — which took place at Bremen from May 12 to 15, 1913 — at the initiative of Prof. K. Escherich of Tharandt (Saxony), a German Society of Applied Entomology ("Deutsche Gesellschaft für angewandte Entomologie") was formed. The object of this society is the formation of a suitable government organization for the purposes of scientific investigation, and of the control of insects which are economically harmful, or disease-carriers, and for dealing critically with the scientific material collected, and making known the practical importance of this subject.

891 - **On the Presence of *Icerya purchasi* and *Novius cardinalis* in the Maritime Alps** (1). — VUILLET, A. in *Bulletin de la Société entomologique de France*, 1913, No. 7, pp. 164-165. Paris, 1913.

In the summer of 1910, *Icerya purchasi* was introduced into an estate on the peninsula of Cap-Ferrat (Alpes Maritimes), whence within two

(1) See also No 621, B. May 1912

(Ed.)

years it spread greatly in the neighbourhood, especially on *Acacia*, *Kennedya*, *Pittosporum*, *Choisya* and *Citrus*. In the summer of 1912, *Novius cardinalis* was successfully reared and acclimatized; this ladybird is the principal natural enemy of the injurious scale insect in question.

At the present time, it is easy to find *Novius* in all stages of development in the zone invaded by *Icerya*.

MEANS OF  
PREVENTION  
AND CONTROL

- 892 - *Cocobacillus cajae* n. sp., a Parasite of the Larvae of *Arctia caja* in France (1). — PICARD, F. and BLANC, G. R. Sur une septicémie bacillaire des chenilles d'*Arctia caja* L., — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, First Half-year, Vol. 156, No. 17 (April 28, 1913), pp. 1334-1336. Paris, 1913.

The larvae of *Arctia caja*, which are numerous this year in the vineyards of the South of France, have fallen victims to two diseases: one, which has been known for some time, is due to *Empusa aulicae* Reich.; the other is of bacterial origin. The dead larvae become flaccid and exhale a nauseous odour; their alimentary canal is devoid of its usual contents and is only filled with a clear liquid, often free from any microorganisms. In pure cultures, the blood contains a *Cocobacillus*, for which the writers propose the name of *C. cajae*, and by means of which they have artificially produced the disease. It is distinguished from *C. acridiorum* Hérèlle by several biological and pathological characters (2). As the experiments made have shown the possibility of infection through the mouth, it is to be hoped that the new *Cocobacillus* may be of practical use.

- 893 - New Peruvian Parasites from *Hemichionaspis minor* (Hym.). — RUST, E. W. in *Entomological News*, Vol. XXIV, No. 4, pp. 160-165. Philadelphia, 1913.

A systematic description of *Prospaltella peruviana* n. sp., *Signiphora lutea* n. sp. and *Neosigniphora nigra* n. gen. et sp., parasites of the "piojo blanco" (*Hemichionaspis minor* Mask.), a scale infesting *Gossypium peruvianum* (native or tree cotton) in Peru.

- 894 - Experiments in the Control of Wireworms. — KAREL, M. Zur Drahtwurmbekämpfung. — *Fühling's Landwirtschaftliche Zeitung*, Year 62, Part 9, pp. 313-318. Stuttgart, May 1, 1913.

In 1912 a series of experiments was undertaken at the Dresden Agricultural Experiment Station on the control of wireworms (*Agriotes lineatus* larvae) which do a lot of harm to the crops every year. Of the numerous methods tried, only three can be recommended for practical purposes: a) placing in the ground half potatoes to serve as a bait for the larvae; b) repeated rolling of the ground; c) the use of nitrate of soda, nitrate of lime or kainit.

(1) See also No. 761, B. June 1913.

(Ed.).

(2) See No. 750, B. April 1913.

(Ed.).

895 - *Aphis papaveris* Injurious to Beets in Northern France (1). — MALAGUIN, A. and MORRIS, A. Le puceron de la betterave dans le Nord de la France. — *La Vie Agricole et Rurale*, Year 2, No. 24, pp. 696-699, 7 figs. Paris, May 17, 1913

During the last few years, and especially in 1911, *Aphis papaveris* Fb. has appeared in large numbers in Northern France, where it has done much damage to the beets. The investigations made by the writers in that district confirm those of the Russian entomologist Mordwilko, who considers that *Aphis papaveris* of beets is the aphid found in spring on *Evonymus europaeus*, whence its name of *A. evonymi* Fb. This insect also lives on different species of *Rumex*, to which it owes its synonym *A. rumicis* L.

From the life cycle of this insect which is given briefly in the article, it appears that during the latter part of the autumn and throughout the winter and early spring, i. e. from October to the end of April, these aphides infest *Evonymus* and the females deposit on this plant the eggs which give rise to the founders of next season's generation. Owing to this circumstance preventive measures against the pest can be both offensive and defensive, as it is possible to kill the parasites on *Evonymus* and by destroying the winter eggs and the spring brood decrease the number of individuals which would otherwise swarm on wild or cultivated plants. In order to do this it would be well to eradicate entirely *Evonymus* in beet-growing districts; but in any case, it is indispensable that the insects infesting these shrubs should be destroyed in March, April and May and also, if necessary, in October.

The writers consider that preventive measures are preferable to remedies, such as spraying, which is only useful when the beets are already attacked and is besides a costly operation and only temporarily efficacious.

Further the assistance of some entophagous Hymenoptera may be requisitioned; this measure was adopted in 1912 with the result that over 50 per cent. of the aphides were destroyed, and the writers propose to continue their investigations in this direction.

896 - A [New Insect Pest on Roses: The Vine Curculio (Weevil) (*Orthorhinus Kluggi* Sch.). — FRENCH, C. JUN. in *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. XI, Part. 1, pp. 240-241, 1 fig. Melbourne, April 1913.

This insect, whose natural food is the wattle (acacia), is common in most parts of the State of Victoria. Of recent years it has done much injury to the vines, and in 1909 it was found on the terminal twigs of Jonathan apples and apricots while now its larvae begin to attack roses also and to cause the death of the stems. As these pests deposit their eggs on the exterior of vines and roses, the writer advises spraying the plants with a deterrent such as coal tar water, the formula for which is as follows: Boil 1 lb. of coal tar in 2 gallons of water, and while hot add from 50 to 100 gallons of water. Benzole emulsion might also be tried. All dead or dying acacias growing in close proximity to a garden should be destroyed by burning.

(1) See also No. 2273, B. July 1911.

(Ed.).

## INJURIOUS VERTEBRATES.

INJURIOUS  
VERTEBRATES

897 - **Results of Experiments on the Control of Field Voles in France (1).** —  
*Feuille d'informations du Ministère de l'Agriculture*, Year 18, No. 16, p. 1. Paris, 1913.

For reasons which are not very clearly defined, the experiments with Danysz virus have given unequal and often insufficient results.

Another poison named "latin", made in Paris by Dr. de Christmas, is being tested for the Ministry of Agriculture in Charente Inférieure (canton of La Jarrie), on an area of over 30 000 acres.

The Special Commission sent by the Ministry to examine on the spot the irregular action of this second remedy, although including it among the methods of controlling field voles, decided that until the cause of the uncertain action of this virus is scientifically determined, it cannot advise the general use of "latin".

(1) See No. 1567, B. Nov. 1912.

(Ed.).

INTERNATIONAL INSTITUTE OF AGRICULTURE  
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

MONTHLY BULLETIN  
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AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

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FIRST PART.  
ORIGINAL ARTICLES

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**The Various Methods of Farming in Spain**

by

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*Professor of Rural Economy at the Special School of Agricultural Engineers.*

This paper (within the limits allowed by a periodical publication) will comprise the following points: grouping of the various Spanish provinces into large regions, and of the arable lands and "aprovechamientos" (meadows, pastures and woods) into large groups in each of the provinces; prevailing form of land tenure; means of production used in large, medium and small farms.

¶ The following illustration will forcibly give only the average general characters of each region, and in each of these the method of farming presents numerous special cases corresponding to certain local conditions, the description of which would be too lengthy to be mentioned here.

The division into agricultural regions, as well as the extent of arable land and of meadows, pastures and woods, corresponds to the official division established by the Ministerio del Fomento for the agricultural requirements of the country and to the statistics recently published by the General Direction of Agriculture.

The provinces included in each region are indicated, so that with the help of a map an idea may be formed of the distribution of the various methods of farming.

**1st Region: Central or New Castile.** — It comprises the provinces of Madrid, Toledo, Guadalajara and Cuenca. The distribution of productive lands is as follows:

Cereals . . . . .	4 939 820 acres
Fruit trees, olives, vines and market gardens . . . .	1 131 109 "
Forests and pastures . . . . .	5 559 481 "

It is thus seen that in this region the extent of arable lands is very nearly equal to that of forests and pastures. Grass leys are very much scattered and subdivided.

Great and medium estates generally prevail. There are many large properties called "dehesas"; some are wooded (pines, oaks, etc.); others are not, and their utilization consists in the renting of pastures within the limits set by the protection of the woods.

The large farms, as well as the olive groves and vineyards, are farmed by the owners themselves and are not rented. Small parcels of land at a distance from centres of population and the market gardens in some localities are rented; the lease lasts two to six years and the rent is generally paid in kind.

In this region the type of medium farms is met with also. The means of production corresponding to this degree of cultural intensity, expressed in percentages of the working capital as stated in a remarkable work (1) by Leopoldo Hernandez, civil engineer and manager of the Corunna Farm, are the following:

	Percentage of working capital
Furniture of owner and staff . . . . .	4.70
Material and implements . . . . .	17.79
Draught animals . . . . .	44.88
Provisions . . . . .	22.66
Circulating capital . . . . .	9.97
Total . . . . .	100.00

*2nd Region: Mancha and Estremadura.*—It comprises the provinces of Ciudad Real, Albacete, Caceres and Badajoz, the two first forming la Mancha and the two latter Estramadura. The distribution of acreage is as follows:

Cereals . . . . .	5 158 889	acres
Fruit trees, vines, olives and market gardens . . . . .	1 503 835	"
Forests and pastures, . . . . .	10 932 220	"

Wine and oil represent the most important crops in la Mancha. For vineyards occupy upwards of 250 000 acres in the province of Ciudad Real and of 150 000 in that of Albacete, while olive groves cover respectively 50 000 and 15 000 acres. Besides, the association of these two crops is equally important. Vineyards and olive groves extend also in to the Estremadura provinces.

In this region, as in the preceding one, the farms are usually managed by the owners themselves or their agents. Leasing is not much practised, while farming on the share system is more frequent.

In the dry lands under annual crops the owner must provide:

a) 75 per cent. of the seed; b) 50 per cent. of the cost of hoeing; c) the cost of the manure used.

The metayer must contribute: a) 25 per cent. of the land tax; b) three preliminary ploughings; c) the cost of sowing and half the cost of hoeing.

(1) *Rentabilidad del Trigo.*

(Authors' note).

the expenses for harvesting, gathering in the crops, threshing, cleaning and storing. One half of the crop belongs to the owner, the other half and the straw to the metayer.

Olive groves are not rented; they are managed by the owner himself or his agent, or worked on the share system. In this case the owner contributes : a) 80 per cent. of the land tax, b) 50 per cent. of the expenses for pruning; the metayer's share is : a) 20 per cent. of the land-tax, b) three ploughings, c) the cost of pruning, if he takes all the wood, and the expense of picking and carting, d) 50 per cent. of the cost of guarding the grove, e) the cost of extracting the oil. The crop of olives is divided into equal parts between the owner and the metayer.

The vineyards are, like the olive groves, either managed by the owner himself or his agent, or worked on the share system, but never leased.

In Estremadura the lands called "dehesas" and covered with oaks are utilized by sending pigs on them to feed on the acorns.

Towards the middle of autumn when the pastures begin to be poor and the acorns on the evergreen oaks, which are earlier than those on the cork oaks, begin to ripen, the feeding begins. The animals are divided into two groups, of which one comprises the two and three year old pigs and the young ones, the other group the females and the one and two year old backward males. The feeding of the animals follows a certain order and is facilitated by knocking down the acorns with poles. Where this is done the "dehesa" is generally divided into four parts and the acorns are knocked down first in the lowest-lying part. The poles used have a stick attached to their upper end in such a way that it can move freely. The acorns are knocked down in the lowest quarter of the dehesa for about a fortnight, after which time the process is commenced in the second quarter for another fortnight and so on. The pigs themselves show when the moment for knocking down the acorns has come and the workmen engaged for this work must not commence it until the animals show their desire to have the acorns. In some localities the acorns are not knocked down and the pigs feed only on the acorns that fall naturally to the ground.

The amount to be paid for the acorns is settled in various ways; the most usual is to fix a certain sum for each arroba (25.36 lbs.) of gain in the live weight of the pigs, which are weighed at the beginning and at the end of the time that they feed on acorns.

The second group, as said above, consists of the sows and of the one and two year old backward males; these animals scatter all over the mountain and feed upon the acorns which fall from the trees, or which have been left on the ground by the preceding group.

**3rd Region: Old Castile.** — It includes the provinces of Valladolid, Burgos, Segovia, Avila and Soria. The distribution of productive lands is as follows :

Cereals . . . . .	5 286 366
Fruit trees, olives, vines and market gardens . . . . .	1 036 083
Forests and pastures . . . . .	3 808 071

From the above it is seen that cereals are the prevailing crops.

The land is generally rented to the farmers. But of late years there is a tendency to replace the old traditional form, according to which the farmers handed down their farms from father to son, by short leases : from 6 to 8 years.

In other parts of the same region there is a tendency to form associations for mutual help : the poor peasants whose only means of production are their own hands and one draught animal join in couples so as to do their work better with two animals than with one, and this irrespective of the difference there may be in the land and in the animals; consequently there is no remuneration or compensation between the parties.

The agreements are generally private and only verbal, though of late here as well as in the other regions there is a tendency to make written private agreements and even before a notary public. The duration of these contracts is generally three or four years for yearly crops, and upwards of five for forest properties.

*4th Region: Aragon and Rioja.* — It includes the provinces of Saragossa, Huesca, T  r  el and Logro  o.

The productive land is distributed as follows :

Cereals . . . . .	3 494 803
Fruit trees, vines, olives and market gardens . . . . .	1 541 490
Forests and pastures . . . . .	6 228 755

In this region permanent grass lands and grass leys have a certain importance, the extent of land devoted to these being at least 74 100 acres.

As a general rule the dry lands under cereals, olive trees and vines are managed directly by the owners or their agents, while the irrigated lands are let, under the name of "torres" to farmers called "torreros" who generally pay their rent in kind (wheat).

In certain regions and in the event of damage caused by the weather, such as frost, hail, floods or drought, it is the custom to diminish the rent proportionally to the extent of the damage done. The amount of this diminution is settled between the lessor and the lessee or by valuation by an expert.

The legal form of these contracts is fixed by local custom; their duration is usually one year, and they are tacitly renewed until one of the parties gives notice of their cessation.

*5th Region: Leon.* — It includes the provinces of Santander, Leon, Palencia, Zamora and Salamanca. The acreage devoted to the various crops is the following :

Cereals . . . . .	6 123 446	acres
Vines . . . . .	162 773	"
Other crops . . . . .	92 877	"
Forests and pastures . . . . .	5915 877	"

In this region the province of Santander is the one which possesses the greatest extent of natural grass lands : about 1 235 000 acres.

In this province the properties are extremely subdivided ; the least usual form of farming is that on the share system, though it exists in some localities ; in this case the owner provides the seed and takes one third of the crops, the farmer bearing all the other expenses of cultivation. If the owner provides manures as well as seeds then he gets one half of the produce.

The chief wealth of this province lies in its live stock. One of the methods of keeping cattle is the share system, according to which the owner gives the farmer one or more head of cattle for a certain time settled upon beforehand between them. The farmer engages to keep the cattle, getting in exchange : a) the whole quantity of the milk produced, b) one half the value of the calves, c) one half of the increase of value of the animals. This increase in value is based on the value of the animals agreed upon by the parties at the beginning of the contract. If on the contrary there is a diminution of value or death of the cattle, the loss is sustained in equal parts by both parties.

In the rest of the region large estates prevail and renting is prevalent ; the rents are paid in kind (wheat); the agreements generally last five years and are for the most part renewable on the same conditions.

*6th Region : Galicia and Asturias.* — It is composed of the provinces Lugo, Orense, Pontevedra and Oviedo. Permanent grass lands are an important feature of this region, as may be seen from the following figures :

Cereals . . . . .	1 991 605
Permanent grass lands . . . . .	897 486
Fruit trees, olives, vines and market gardens . . . . .	344 995
Forests and pastures . . . . .	61381 616

In this region landed properties are exceedingly subdivided and scattered, and the farms are rented without any limitation as to time; this system of leasing is called "foros" and "subforos"; nevertheless recently a tendency has arisen to limit the duration of these leases, generally to four years ; when the time is not specified in the agreement, it is understood that it is to last all the time required to harvest the produce, even if it extends to two years or more, according to the rotation. The payment is most frequently effected in cash.

The following are data referred to a typical small farm of the region.

According to the agricultural engineer above-mentioned, for a farm divided as follows :

Wheat . . . . .	3.46	acres
Meadows . . . . .	1.16	"
Kitchen garden . . . . .	1.10	"
Uncultivated land . . . . .	4.44	"

the means of production corresponding to this degree of intensity of culture and represented by percentages of the working capital are the following :

House furniture . . . . .	7.6	per cent.
Material and implements . . . . .	10	— » »
Draught animals . . . . .	28.5	» »
Productive animals . . . . .	36.1	» »
Provisions for the family . . . . .	9.5	» »
Circulating capital . . . . .	8	— » »

*7th Region: Navarre.* — It comprises the provinces of Navarre, Alava, Vizcaya and Guipuzcoa. The productive lands are divided as follows:

Cereals . . . . .	990 907
Grass leys, . . . . .	95 549
Fruit trees, vines, olives and kitchen gardens . . . . .	85 536
Forests and pastures . . . . .	3 084 190

In Guipuzcoa apple trees are cultivated to a great extent; their fruit is used for the preparation of a cider called in the country "sagardua."

In this region the small farms are worked by the owners themselves, the larger ones are rented or worked on the share system.

The social conditions are such that the agreements are almost always only verbal and rest on the good faith of the contracting parties. There are however exceptional cases in which the agreements are drawn up in writing with all the usual formalities. Generally no caution money is required, but lately a surety is asked for. The contracts last six years or an indefinite period, and at the end of the lease the farms must be returned to their owners in the same state in which they were consigned.

In cases of loss of harvest due to hail or other weather causes the rent is diminished by mutual understanding between the parties; the good faith on both sides is evidenced by the fact that the owner delivers into the farmers' hands breeding and productive live stock for him to keep and to utilize within certain limits, without the contract containing any clause contemplating a breach of trust on the part of the farmer.

*8th Region: Catalonia.* — It embraces the provinces of Barcelona, Tarragona, Lerida and Gerona. The productive lands are distributed as follows:

Cereals . . . . .	1 554 958
Fruit trees, vines, olives and kitchen gardens . . . . .	1 612 584
Forests and pastures . . . . .	5 570 033

In this region the vineyards and olive groves are very important; the vineyards have been reconstituted on American stocks.

The share system prevails, not only in the farming of the land, but also in the keeping of live stock. The properties are not cultivated by the owners themselves except in the cases of very subdivided properties. The practice of renting the land is widespread but not so general as the share system, the duration of which varies from one year to an indefinite period, the custom being to give one year's notice.

In this region there exists a form of share system called "masoveria" which really partakes of the share system proper and of renting, because it entails payment of a sum in money besides dues in kinds; but what characterizes the system is the fact that the farmer or "masover" inhabits, in the house belonging to the property, certain rooms which are set apart for him (he being charged with the upkeep of the house and annexed buildings: cellar, granaries, etc) and takes the produce of the small kitchen garden usually attached to the house, as well as the fire wood that he requires.

As for the keeping of sheep on the share system, the owner and the farmer contribute equal shares for the purchase of the flock; if the pastures belonging to the property are insufficient, both parties contribute equally to the rent of the additional pastures; the salary of the shepherd is paid likewise by both, while his board is defrayed by the farmer; the cost of shearing is borne in equal shares by both partners, who divide also the profits or losses.

*9th Region: Levante.* — It includes the provinces of Valencia, Castellon, Alicante and Murcia. The productive lands are divided as follows:

Cereals . . . . .	2 391 992
Fruit trees, vines and market gardens . . . . .	1 788 499
Grass leys . . . . .	201 428
Forests and pastures. . . . .	3 243 503

In this region orange and fruit trees and market gardens are very important. The market gardens at Murcia occupy 26 600 acres, which are intensively cultivated; it is the same with the market gardens of Valencia and of Orhnela in the province of Alicante.

Direct management by the owner is limited to the small farms.

The prevailing systems are: leasing and the share system.

In the dry lands the duration of the lease averages 5 years, and the rent is usually paid in kind. These lands sown to cereals are called in the greater part of the region "white lands"; they are also worked on the share system and in this case the owner must: a) provide 75 per cent. of the seed; b) pay half the cost of hoeing and sometimes a part of the expenses of reaping according to a fixed rate per bushel of seed, and lastly he must pay for the manure.

The farmer must: a) pay 25 per cent. of the land tax; b) plough the soil three times in order to prepare it for the crop; c) defray the cost of sowing and one half the cost of hoeing, reaping, cartage, threshing, cleaning and carriage to the granary. The owner gets one half the grain as his share and the farmer the other half and the straw.

The irrigable lands are farmed in a variety of ways according to localities.

The olive groves are not usually leased; the same may be said of vineyards, which are farmed on the share system, usually for two years at a time.

*10th Region: Eastern Andalusia* — It is formed by the provinces of Grenada, Jaen, Malaga and Almeria. Its productive lands may be divided as follows:

Cereals . . . . .	3 098 536 acres
Fruit trees, vines, olives and market gardens	1 443 293 "
Grass leys. . . . .	621 205 "
Pastures and uncultivated lands . . . . .	459 647 "

*11th Region: Western Andalusia.* — It includes the provinces of Seville Cadiz, Cordova and Huelva. Its productive lands are divided as follows:

Cereals . . . . .	3 968 542 acres
Fruits trees, vines, olives and market gardens	1 410 247 "
Grass leys . . . . .	1 295 873 "
Pastures and uncultivated lands . . . . .	4 937 505 "

These two regions may be considered together, as their systems of farming are the same.

The cultivation of the olive tree is very important in both of them.

Great estates are prevalent, and they are generally managed by the owner himself or his agents; nevertheless the practice of leasing the land has of late been gradually extending. The lease is generally a six years' one; sometimes a mortgage guarantee is required, or a personal guarantee with or without surety.

The least widely spread form of farming is that on the share system; there are however cases in which two farmers engage in a metayer agreement to farm an estate which they hold under the usual rent conditions. The agreements are generally made by a public notary.

As has already been said, large estates prevail in this region, and according to the engineer already mentioned, the working capital of a property of 2650 acres may be divided as follows:

Furniture . . . . .	7.51 per cent.
Material and implements . . . . .	19.56 "
Live stock. . . . .	44.72 "
Provisions. . . . .	13.20 "
Circulating capital . . . . .	15.01 "
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	100.00
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The 12th and 13th regions comprise the Balearic and the Canary Isles; they are not described here, not being in the peninsula.

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## The Study of Colonial Agriculture in Italy

by

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Interest in colonial agricultural problems has only quite recently been aroused in Italy among the general public and the studious classes. It may be said that up to within a few years ago the study of colonial agriculture was almost completely neglected in this country and that during the last five years it has received a powerful stimulus from the propaganda exerted in its favour by a few students of the subject and still more from the necessity felt by the country of a better knowledge of its growing colonial possessions and of the means of utilizing them better. The conquest of Lybia succeeded better than the Eritrean and Somali colonies in causing agricultural research in the colonies to be held in higher consideration and in bringing into prominence the few institutions which already for some years had devoted themselves to this study. And if it is useful to inform the public of the best work done in this branch of scientific and technical activity, it is not without interest to recall the beginnings of this salutary and promising awakening, all the more so as these also belong to the near past.

So long as the occupation of Eritrea was limited to the coast, there was no inducement to take up the study of the agricultural problems of that colony owing to the limited extent of the conquered territory and to its low natural wealth. Thus the first step in the direction of colonial agricultural study dates back only to 1891, in which year, after the occupation of the Eritrean plateau, the Royal Decree of January 25 instituted a Colonization Office under the Councillor for Agriculture. Then at Asmara an Agricultural Experiment Station was founded, as a basis for colonizing the temperate districts of the Colony (1).

But the political events of 1895 and 1896 stopped the experimental work that had so auspiciously begun, and prevented the government for several years from resuming the agricultural study of the colony in its temperate districts and from extending it to the torrid and semi-torrid zones. Thus it was not until 1901 that the interrupted work was taken up again, when the Government of Eritrea entrusted an agricultural expert

(1) Reports of Baron LEOPOLD FRANCHETTI, Member of the Italian Chamber of Deputies on the work of the Bureau of Agriculture and Colonization of Erytrea, presented by the Minister of Foreign Affairs in the sittings of March 3, 1893, and April 28, 1894.

with the task of reporting upon the agricultural possibilities of the most important districts of the colony and of drawing up plans for a regular agricultural experiment service. The Report (1), after having described the various agricultural regions which make up the colony, the conditions of native agriculture and the natural resources of the country, proceeded to examine the crops and the live stock that might be raised with probability of success and lastly proposed the establishment of an agricultural experiment station in the Colony. The Report further expressed the wish that in Italy centres of cultivation and of study should be established with the objects of keeping in close touch with the Agricultural Bureau, of preparing the experts necessary to exploit the Colony and of calling the attention of the public to colonial agricultural problems in general. At the same time, in the year 1901 the first experiments on tobacco and cotton growing were made in Eritrea, the latter proving very satisfactory (2).

The Colonial Government approved the proposed Agricultural Experiment Bureau, which was founded in 1902, and in 1909 was incorporated in the Colonization Bureau. The activity of the agricultural experiment service has not been hitherto very marked; nevertheless the first results of its experiments with exotic plants, and a more accurate study of some regions, have enriched our agricultural literature by some valuable volumes (3) whilst the collections of vegetable products, both spontaneous and cultivated, and of the products of animal husbandry prepared by that Bureau for the exhibitions of Florence, Ravenna, Asmara, Milan, and Turin, and carefully illustrated by well arranged catalogues (4), showed in their real light the agricultural possibilities of Eritrea.

(1) DR. GINO BARTOLOMMEI GIOLI. *L'Agricoltura nell'Eritrea*. Report to the Royal Special Civil Commissioner. Later republished in the *Bollettino dell'Emigrazione*, No. 16, Year 1906, under the title: *Agricoltura e Colonizzazione nell'Eritrea*. On the same subject: G. B. GIOLI. *Le attitudini della Colonia Eritrea all'agricoltura*. — *Atti della R. Accademia dei Georgofili* 1912. DR. G. B. GIOLI. *La colonizzazione agricola dell'Eritrea*. — *Atti R. Accademia dei Georgofili*, 1903.

(2) AURELIO PAOLETTI. *Resultati degli esperimenti di cotonicoltura eseguiti nel 1901-02*, attached to the *Relazione su la Colonia Eritrea del R. Commissario Civile Straordinario* (years 1900-01).

(3) BALDRATI, I. *La coltivazione del sesamo nella Colonia Eritrea*. From the *Rivista Coloniale*, 1906, p. 8.

BALDRATI, I. *L'arachide*. Abstract from *Agricoltura Coloniale*, 1907.

BALDRATI, I. *L'Agave sisalana*. From *Agricoltura Coloniale* 1907.

BALDRATI, I. *Le piante tessili della Colonia Eritrea*. From *Almanacco dell'Italia Agricola*, p. 11.

BALDRATI, I. *Le condizioni agricole della valle del Barca*. *Biblioteca Agraria Coloniale*, No. 4. Edizioni dell'Istituto agricolo coloniale italiano, Firenze.

(4) BALDRATI, I. *Catalogo illustrativo della Mostra agricola dell'Esposizione Orto-avicola di Firenze, anno 1903*. Appendici: *Indice della mostra zilologica del R. Istituto Botanico di Roma*.

BALDRATI, I. *Catalogo illustrativo della Mostra Eritrea nella Esposizione Internazionale di Milano*, 1906.

Besides the work of the Agricultural Experiment Bureau, special researches on questions concerning live stock and forestry (1) must be mentioned, as well as the solutions given to some technical problems by local agricultural undertakings, such as cotton plantations (2).

There is no doubt that the agrological study of Eritrea, to which geologists, botanists, hydraulic engineers, economists (3) and jurists have contributed, has not only aroused the interest of the public in such researches, but has also favoured the formation of a nucleus of experts in colonial agriculture.

Italian Somaliland, though from the political point of view more fortunate than the older colony, may be said to have been opened up to agricultural investigations only during the last few years; during the first period of our effective occupation the modest Agricultural Bureau which had been installed there, was not in a position — for several reasons — to do the work for which it had been founded, and had to confine itself to a summary study of the limited extent of territory then accessible to investigations (4). But later, in 1910, when the extent of territory occupied had increased and the inhabitants had been pacified, the present government replaced the experimental agricultural service by an Advisory Bureau for agricultural undertakings, from which the experimental service depends. And notwithstanding the fact that the Advisory Bureau has only been a few years in existence, the work which it has accomplished, as it appears from some important reports (5), promises useful results; it follows a plan of action based on the same lines as those adopted by the neighbouring English and German colonies, but aiming at the same time at giving agricultural colonization in Somaliland a special character corresponding to the climatic and hydrological conditions of the country and to our particular ethnological and economic tendencies.

(1) MARCHI, EZIO. *Studi sulla Pastorizia della Colonia Eritrea*. Biblioteca Agraria Coloniale, No. 1. Ediz. dell'Istituto Agr. Col. Ital. 1910.

FIORI, ADRIANO. *Boschi e piante legnose dell'Eritrea*. Biblioteca Agraria Coloniale, No. 7. Ediz. dell'Ist. Agr. Col. Ital. 1912.

(2) Società per la Coltivazione del cotone nella Colonia Eritrea, *Cosa si è fatto nei primi quattro anni*. GINO LAVELLI DE' CAPITANI, relatore, 1909.

(3) The following publications are worthy of special mention:

NICOLA COLLETTA, C. E.: *Sull'utilizzazione a scopo d'irrigazione delle acque del fiume Gasc nella Colonia Eritrea*.

GIOTTO DAINELLI and OLINTO MARINELLI: *Resultati scientifici di un viaggio nella Colonia Eritrea*. R. Istituto di Studi Superiori Pratici e di Perfezionamento di Firenze, 1912.

*L'Eritrea Economica*: a cura della Società di Studi Geografici e Coloniali di Firenze, Edizione dell'Istituto geografico De Agostini, Novara, 1913.

ODOARDO BECCARI: *Le Palme del genere "Raphia"*. Biblioteca Agraria Coloniale No. 2. Edizione dell'Istituto Coloniale Italiano 1910.

(4) CESARE MACCALUSO. *L'agricoltura nella Somalia Italiana meridionale (Benadir) in Bollettino Ministero Affari Esteri*, Anno 1908. Rome, 1908.

(5) ROMOLO ONOR. *Allegati alle Relazioni del governatore della Somalia Italiana presentati negli anni 1910 e 1912*.

The researches of scientists and of technical experts in geology, hydrology, hydraulics and natural science that have already appeared (1), and those that will be published (2), support and complete the work of the Advisory Bureau, as the juridical study of the tenure of land will supply the basis for the regular preparation of agricultural colonization.

It will be well now to refer briefly to the work begun by Italians to illustrate the physical, agricultural and economic conditions of Libya, and to examine what results are likely to be attained by agricultural undertakings. Many works of compilation have recently been published with the object of showing the agricultural and economic value of the colony, but hitherto only a few are original and the result of serious research carried out on the spot by experts. Among these the Report (3) of the Agrological Mission sent to Tripoli last year by the Ministry of Agriculture, Industry and Commerce is worthy of special mention. This report is the most complete contribution to the study of the Tripoli district from the agricultural point of view as well as from the botanical, hydrogeological and zootechnic. This classical work leads us to expect equally good results from two other agrological missions sent in February of this year to Tripoli in order to continue the studies and researches. Of these two missions one is official (4); the other is sent with a similar object by the Italian Association for the study of Libya (5).

Within a few months Cyrenaica will be open to research and the rich harvest of data collected in a praiseworthy work of a correspondent of the Istituto Agricolo Coloniale Italiano at Bengasi (6) is a guarantee of the importance and novelty of the agricultural problems which that rich province offers to the students.

Much less important than the above mentioned are the contributions by our investigators to the solution of the agricultural problems of foreign countries. And while our emigration beyond the limits of Europe had

(1) GUIDO MANGANO and G. ROSSI, *Studio analitico di alcuni terreni della Somalia Italiana meridionale*. Edizioni Istituto Agricolo Coloniale Italiano, 1909.

17° Congresso degli Italiani all'Estero, Roma, 1911. Sezione VIII. Relazioni varie.

(2) The results of agricultural enquiries carried out during 1911-12 by Drs. G. Scassellati and N. Mazzocchi are now in the press.

A mission composed of Professors G. Stefanini and G. Paoli is at present in the colony engaged in a study of the country from the point of view of the naturalist and the hydro-geologist.

(3) Ministero di Agricoltura. *Ricerche e studi agrologici su la Libia. - La zona di Tripoli*. Relatori DE CILLIS, FRANCHI, TROTTER e TUCCI.

(4) Members of the Commission are the following Professors: Parona, Cavara, Coletti, Crema, De Cillis, Di Tella, Drago, Eredia, Franchi, Odifredi, Peglion, Simonetti, Trotter, Tucci, Valenti. Secretary: Mazzocchi.

(5) The mission under the leadership of Senator Baron Leopold Franchetti is composed of Professors Gugnioni, Manetti, Pampanini, Pucci and Stella.

(6) CARLO MANETTI, *Appunti di Agricoltura Bengasina*. Ministero degli Affari Esteri, Ufficio di Studi Coloniali, No. 22, Novembre 1912.

already, towards the end of last century, succeeded in creating strong and flourishing colonies abroad it had not promoted among the governing classes of the mother country any decided inclination towards those problems that the people so bravely faced and often successfully solved.

The character of our emigration, chiefly proletarian, its extent, and the difficulties attendant upon the technical and scientific study of distant foreign countries, did not induce Italian students to devote themselves to agricultural colonial questions; they have only lately received an efficient stimulus to face these problems when a better understanding of the task to be accomplished by our colonies has given a more solid basis to our interest in them.

It is thus to this last period that some important studies made by Italian agronomists on North and South America, on Australia and on some parts of Africa belong. These works are mainly intended as material for the preparation of plans of colonization, but sometimes they are the result of investigations that have no exclusively speculative object (1).

After this brief review of the work done by our students in the field of agricultural research in the colonies, it will be well to see what has been done in the mother country to promote and organize this new order of investigations with the object of providing agricultural colonization with the indispensable technical knowledge

In the domain of botany applied to colonial requirements two institutions are of especial assistance for colonial investigations, namely the Royal Colonial Garden at Palermo and the Royal Colonial Museum and Herbarium in Rome, both of which are annexed to the respective Botanical Institutes.

The latter was the first Institute of colonial scientific character founded in Italy (1904). Its objects are: to collect in the colonies belonging to Italy, specimens of the flora and of the useful and utilizable plant products connected with them. The institute further studies these collections (2) in order to acquire a more complete knowledge of the resources of that flora; the usefulness of this work will be easily understood and is further shown by the many botanical publications and some agricultural ones issued by the Institute (3).

The Royal Botanic and Colonial Garden at Palermo aims chiefly at introducing, cultivating, improving and spreading those plants which possess economic or industrial importance for Sicily or for our African colonies. It began to work regularly in 1907 when its buildings and

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(1) In this connection see: *Bollettino dell'Emigrazione*, published by the Commissariato dell'Emigrazione, *L'Agricoltura coloniale* of the Istituto Coloniale Italiano of Florence, *La Rivista Coloniale*, organ of the Istituto Coloniale Italiano of Rome, and several agricultural periodicals of the Kingdom.

(2) The activity of the Institute is shown by the numerous publications, mostly of botanical character, which have appeared in the Annals of the same Institute and in several other botanical periodicals.

(3) See the publications of the Bureau of Colonial Studies of the Ministry of Foreign Affairs, and other periodicals.

grounds were enlarged. Some investigations on rubber plants were completed, the possibility of cultivating *Agave sisalana* in Sicily was ascertained, and other exotic plants were spread. The study on cotton was resumed and new hybrids were made and tried in Sicily. Numerous reports, monographs and investigations bearing more or less upon colonial subjects and published in the organ of the Royal Botanic and Colonial Garden and other periodicals (1) bear witness to the activity of the institution. In order to place this garden in a position to meet the most recent requirements of the task of utilizing our colonies, a Bill has been presented to Parliament with the object of ensuring its existence and of voting the necessary funds for its more practical and efficient action.

Lastly, the only Italian colonial institution of a purely agricultural character will be mentioned. In founding it, its promoters contemplated filling up a gap in our educational institutions, which was the principal cause of our want of preparation for the work of exploiting our new colonies. In 1904 the preliminary work was begun for the foundation of an important Italian colonial agricultural institution having the following aims: to act as a centre of information, advice and propaganda for all matters dealing with the agriculture, animal husbandry and natural resources of the political and other colonies, to prepare the higher and subaltern staff for colonial agricultural and live stock farms; to complete the Government agricultural experiment work in our territorial colonies; to introduce into Italy new practical systems of farming and of live stock raising as well as plants and animals from extra-European countries; to study improved methods of farming and of breeding that had already been introduced into Italy, but had not yet been sufficiently experimented; lastly to get into touch with foreign institutions for the exchange of material and of information. A part of this extensive programme was carried into practice in 1906, and in 1908 the Italian Colonial Agricultural Institute was in full working order. Today every one of its branches is accomplishing an ever increasing amount of work, thanks to the financial help of Government and local bodies and the support of other Florentine institutions (2). It possesses abundant demonstration material collected in its museum of agricultural produce, and is provided with a library, laboratories, hothouses, and a staff that has been well trained for its work by much study and by travel in the colonies. Five years ago the theoretical-practical school of colonial agriculture for the young men who have been through the practical schools of agriculture or the agricultural section of the Royal technical institutes, was opened and most of its licentiates have found satisfactory employment in farms belonging to private persons or to companies or in government offices in Eritrea, Somaliland, British Africa, Nyasaland, Malacca, Argentina, Brazil, Texas, Montenegro, etc. But the educational function of the Institute is becoming gradually more

(1) See *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo* and the publications of the Bureau of Colonial Studies of the Ministry of Foreign Affairs.

(2) Among these the following deserve special mention: The Royal Botanic Institute, the Royal School of Pomology and Horticulture, and the Royal Station of Agricultural Entomology.

complete by the addition of higher courses. Thus last year a course of colonial veterinary pathology was instituted for doctors in veterinary science, and the results were most encouraging. This year a higher course of colonial agriculture will be added for men holding a doctor's degree of the Royal higher schools of agriculture and will be chiefly devoted to our African colonies, while separate lectures or series of them will continue, to be held on various subjects and on the agricultural conditions of those countries beyond the seas to which our emigration flows.

Besides the above educational work the Institute has published for the last seven years the *Agricoltura Coloniale* and a series of colonial agricultural works, of which already eight volumes have appeared (1).

It publishes also reports and colonial agricultural monographs and by means of its agricultural experimental service it furnishes plants, new seeds and breeding animals, and gives advice and information. It possesses also a library, a chemical and technological laboratory, hothouses and land for experiments.

The Institute has prepared several missions for the agricultural study of some colonial districts and has drawn up programmes for missions; among the latter the plan for a mission intended to study Libya (2) from an agricultural point of view, and which was presented to the Ministry of Foreign Affairs in the autumn of 1911, is to be mentioned, whilst among the former it is worthy of note that the Institute has supplied technical and scientific experts for exploitations in British and German East Africa, British India, Java, Italian Somaliland, Eritrea, Libya and Angola. Nor must it be forgotten that the Ministry of Agriculture, Industry and Commerce commissioned the Board of the Institute to represent Italy at the International Congress of Tropical Agriculture at Brussels in 1910 (3) and that the Institute works in close connection with other kindred Italian institutions in the field of agricultural investigations.

From the above summary it will be seen that the Institute is at present the centre best adapted to promote the study of colonial agriculture in Italy and the one which has made the greatest number of scientific and practical contributions during the last five years to the study of colonial agriculture.

(1) Besides the works previously mentioned there are the following:

OBERTO MANETTI, *Istruzioni per la raccolta d'informazioni e di prodotti agrari nei paesi extra europei*. No. 3.

ISAIA BALDRATI, *Le condizioni agricole della valle del Barca*. No. 4.

ZIMMERMANN MORESCHINI, *Istruzioni per la coltura del cotone nell'Africa*. No. 5.

MANETTI, OBERTO, *Le colture aride, "Dry Farming"*. No. 6.

W. LA BAUME, and A. MORESCHINI, *Le cavallette africane*. No. 8.

(2) *Progetto di Missione di Studio in Libia*. Relazione a S. E. il Ministro degli Affari Esteri del direttore dell'Ist. Agr. Col. Ital.

GINO BARTOLOMMEI GIOLI, Ufficio di Studi Coloniali, No. 14. July 1912.

(3) GUIDO MANGANO, *L'opera del Comitato per la partecipazione dell'Italia al 2° Congresso Internazionale di Agronomia Tropicalis*. — Brussels 1910 - Relazione a S. E. il Ministro di Agricoltura, Industria e Commercio.

Want of space does not allow us to mention other secondary, but promising, symptoms of the reawakening in Italy of interest in the study of colonial agriculture, because they manifest themselves in so many ways that they cannot be succinctly described. The daily press, the technical and scientific periodicals, as well as congresses, academies, laboratories, colonial, geographical and speculative institutions (1), all devote a part of their activity to agricultural and colonial questions and draw the attention of the public to technical problems which it had not been in the habit of considering.

## Viticulture in Hungary

by

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When the Hungarians, on coming from Asia, took possession in the ninth century of the present country of Hungary, they found vine-growing prosperous there, this industry having been introduced in the third century by the Emperor Marcus Aurelius Probus into the Roman Province of Pannonia. Although on first occupying Hungary the Hungarians led a somewhat nomadic life, there were amongst them, already in the tenth century, numerous vine-growers and agriculturists. Béla IV, king of Hungary, founded in the thirteenth century, in the neighbourhood of Tokay, colonies of Italian vine-growers; these imported from the district of Formia, cuttings of the "formint" vine, which received the name of their city and afterwards became the parent-variety of the celebrated Tokay wine.

The conditions of soil and climate obtaining in Hungary are most favourable to viticulture, which became increasingly prosperous both in the various mountain districts, and on the plains and sandy hills.

Unfortunately, phylloxera in spreading rapidly over all the neighbouring countries of Europe, did not spare Hungary. Its first appearance was recorded in 1875 in the southern districts of the country, notably at Pancsova, and in spite of energetic measures (the uprooting of the infested vines) it proved impossible to eradicate the pest. From 1880 the ravages of this insect extended to other districts.

According to the data of the survey made on the appearance of phylloxera, vines then occupied 1 050 978 acres, of which 884 371 acres were in Hungary proper, and 166 606 acres in Croatia-Slavonia.

(1) Reale Accademia dei Georgofili, Florence. — Istituto Italiano per l'Espansione Coloniale e Commerciale, Venice. — Istituto per gli Scambi Internazionali, Genoa. — Società Africana d'Italia, Naples. — Istituto Coloniale Italiano, Rome.

In 1884, the area under vines increased to 1 076 446 acres, which proves that at that date more vines had been planted than had been destroyed by phylloxera ; but since 1885 the number of newly planted vines no longer compensated for those destroyed by the parasite. In 1895 the vineyard area had decreased to 606 150 acres. Since the latter date, however, the reconstitution of the vineyards which had been destroyed and the planting of vines in the sandy districts has received a fresh impetus, and in 1911 the area under vines in Hungary was 883 924 acres.

The following figures give the total vineyard area according to the annual returns and the amount of wine produced in Hungary.

Year	Area in acres			Wine production in gallons		
	Hungary proper	Croatia Slavonia	Hungary State	Hungary proper	Croatia Slavonia	Hungary State
1885	908 103	168 101	1 076 204	132 554 246	29 257 800	161 812 046
1890	768 466	133 079	901 545	83 383 175	8 142 068	91 525 918
1892	614 588	140 308	754 921	19 471 474	4 566 650	min 24 038 124
1895	501 077	105 074	606 150	47 152 556	6 413 616	53 566 172
1898	514 938	98 173	613 111	27 820 188	4 083 904	31 904 082
1900	547 939	94 816	642 756	40 135 964	7 351 740	47 487 704
1905	636 719	105 691	742 410	77 424 468	16 311 416	93 735 884
1908	715 344	98 380	813 724	159 170 286	36 872 616	max 196 042 902
1910	753 725	111 049	864 774	62 143 730	5 442 514	67 586 244
1911	770 778	113 146	883 924	101 549 668	19 177 730	120 727 198

In Hungary proper the area of vineyards, in 1911, was divided as follows :

a) Vines grafted on American stocks resistant to phylloxera . . .	259 350 acres
b) Vines treated with carbon disulphide . . . . .	99 889 »
c) Other vines in compact soil . . . . .	94 317 »
d) Vines planted in sandy soils . . . . .	317 222 »

Total . . . 770 778 acres

The figures relating to these categories in Croatia-Slavonia are not yet known. On account of the ravages of phylloxera and mildew, the annual wine production of the State of Hungary varied from 1891 to 1900, between 24 038 124 and 53 566 172 gallons. Nevertheless, since the beginning of

the twentieth century, the work of the reconstitution of the vineyards which had been destroyed and the plantation of new ones has developed uninterruptedly, so that in spite of frequent misfortunes, Hungary produced between 1907 and 1911 an annual average of 116 738 600 gallons of must, of which 95 622 714 came from Hungary proper and 21 115 886 from Croatia-Slavonia.

From the time of the phylloxera invasion, the Hungarian Government has frequently sent experts to study the control measures adopted in France and has lost no time in taking energetic measures which assured, and still continue to assure, to our vine-growers efficacious and valuable assistance.

In order to destroy the first centres of infection, the State paid compensation to the owners for all the vines which were up-rooted. This measure had not, however, the desired results. At the present day, the control methods most employed in Hungary are ;

1. Planting vines grafted on phylloxera-resistant American stocks.
2. Treating the vines annually with carbon disulphide.
3. Planting on sandy soil where phylloxera cannot exist. Such soil occupies vast areas in Hungary. These three measures were adopted with the efficacious assistance of the Government. At first, American direct bearers were also used, and the submergence of the infected vineyards was practised, but at the present time both these expedients have been abandoned. In Hungary, American direct bearers are not in favour; further, their resistance is doubtful, while as the vineyards most attacked by phylloxera are situated on the mountain slopes, their flooding is an impossibility.

In order to preserve the old vineyards which have been infested by phylloxera, the Government undertakes to supply cultivators with all necessary directions for the carbon disulphide treatment and to facilitate the purchase of insecticides and of injectors. To this end it first imported carbon disulphide from abroad; and later, in 1886, it established a national factory at Zalatna (Transylvania) which was afterwards followed by another established at Pozsony by the Dynamite-Nobel Society. These two factories are able to supply the demands of the country. Further, the Minister of Agriculture has installed in the different vine-growing districts of Hungary stores of carbon disulphide (there are at present 104) coming from the two above-mentioned factories. The cost of the transport from the factories to the stores is defrayed by the State.

In some of the vine-growing districts, the Minister of Agriculture has established model vineyards which are treated with carbon disulphide in order that those interested in the systematic use of this remedy may see the results that may be obtained. In 1911, the area of vineyards treated with carbon disulphide in Hungary amounted to 99 815 acres, of which the greater part was newly planted.

In order to spread the prophylactic measure of using American stocks which are phylloxera-resistant, the Minister of Agriculture has planted many experiment fields in the country; he has also taken trouble to raise in the State nurseries, and place at the disposal of vine growers the stocks necessary

for reconstituting vineyards. The stocks and grafts of American vines produced in these nurseries are on sale every year at moderate prices ; but in order to prevent speculation, they are only sold to vine-growers for use in their own vineyards.

The experiments made have proved that *Riparia Portalis* (Gloire de Montpellier), *Vitis Solonis*, *Rupestris Monticola* and *Rupestris Metallica* give the best results as stocks ; these varieties are also grown by preference in the State nurseries. About 2 500 000 grafts and from 40 to 50 million cuttings are produced annually.

In addition to the State nurseries, these are others made by the communes, municipalities, viticultural associations and also by private individuals; these enjoy the support of the Government and also place on the market every year many millions of cuttings and of scions for grafting. The grafts are usually whip-grafts. In some regions, herbaceous grafts are also made in the following way: American vines on their own roots are planted in the nursery, and in the following June, the green scions are grafted upon them, while in the autumn of the same year, the grafted vines are planted out in the vineyards.

Law 5 of 1896, which was passed for the encouragement of vineyard reconstitution, gave a great impetus to vine-growing in Hungary.

This law allowed vine-growers to obtain the funds necessary for replanting by means of loans granted without guarantee at a relatively low rate of interest, and under advantageous conditions which would have been impossible without the assistance of the State which assumed the responsibility of these loans. The latter were made by a special Committee composed of delegates of the Ministries of Agriculture and of Finance, and of the representatives of the Hungarian "Banque Agraire et des Rentes", which at once provided the funds.

According to the provisions of the above-mentioned law, loans for the purpose of vineyard reconstitution could be granted until the end of 1910. Since that date, they have no longer been obtainable.

These loans, which are redeemable at 5.25 per cent, offer two advantages over other mortgage loans, viz.: the loans are not made in bonds, but the whole sum is paid in cash ; on the other hand, repayment is not required until the vineyards begin to bear (but must be made not later than November 1 of the fifth year reckoned from the payment of the first instalment of the loan), unless the borrower wishes to anticipate the repayment. Repayment is made in fifteen annual payments due every 1st of November. Loans have only been granted for the purpose of the reconstitution of vineyards attacked by phylloxera and upon the condition that either vines grafted on American stocks are used, or else European vines treated with carbon disulphide. From 1897, the date of the first loans, until the end of 1910, when loans were no longer made, 9099 vinegrowers received on loan the sum of £ 1 252 530 for the reconstitution of vineyards occupying a total area of 17 042 ar. cad. (about 24 700 acres).

These loans have had a good effect both upon the reconstitution of vineyards and the propagation of systematic vine cultivation.

The fact that the borrowers are obliged by the terms of the law to cultivate their vineyards in a systematic manner according to a prescribed method of management, and are under the control of experts, until the whole loan is repaid, has largely contributed to systematic cultivation, since even those vine-growers who have not borrowed money, are quickly learning the principles to be followed.

Before the invasion of phylloxera the importance of sandy soil for vine-growing was unknown in Hungary.

Since the immunity of sand has been recognized, the vine-growers are increasingly encouraged to make experimental plantations on sandy soil. These experiments have shown that excellent wines can be obtained from vines growing on the latter, provided the vines are carefully selected, and that the rules of systematic cultivation are observed. From this date, a great impetus was given to vine-growing on sandy soil and land with shifting sand, which was once valueless, is sold at prices which could never have been obtained before the appearance of phylloxera.

The credit of having taken the initiative in this matter belongs to the Government. In 1883, it established the first nursery and the first experiment fields on sand, thanks to the patriotic generosity of the town of Kécskémét which gratuitously made over to the State an area of 284 acres which received the name of "Miklós telep" (the Miklos nursery). This measure was destined to save the excellent Hungarian vines (1).

Further, towards the end of last century, the Minister of Agriculture divided, under very advantageous conditions of payment, an area of 5 000 "arpents" (7 109 acres) on the national domain of "Deliblat" (County of Temes) amongst the vine-growers who had suffered from phylloxera. It also obtained for them, under very favourable conditions, other land with sandy soil (2 943 arpents cad.) 4 184 acres in the counties of Komárom, Fejér, Somogy, Pest-Pilis-Solt-Kiskum, and Szabolcs.

According to official statistics there were, in 1911, in Hungary proper 317 222 acres of vineyards on sandy soil, most of which had been planted since the phylloxera invasion.

After phylloxera, mildew and *Conchylis* have caused most injury to the Hungarian vineyards; the former made its appearance in 1891, while the second was first recorded some years ago. At present, the use of Bordeaux mixture as a remedy for mildew is widespread throughout the country. In 1911, 716 191 acres of vineyard were sprayed with this compound. Thanks to the intervention of the Hungarian legislation, these new and replanted vineyards enjoy exemption from taxation for ten years, no matter what method has been adopted in their reconstitution. Those replanted in sand enjoy 6 years, exemption.

In Hungary proper, there are at the present time 8 National Schools for Vine-Growers founded by the State and grouped into two categories: secondary schools for practical and theoretical instruction, and primary

(1) See No. 768. B. May 1912.

(Ed.).

schools for practical instruction only. The course at the first is 2 years, that at the other is one year. In all these schools, instruction is free, and most of the students also enjoy free board and lodging. For the purpose of propagating and developing the systematic handling of wines, the State established in 1901 at Budafok, in the vicinity of Budapest, a Special School for Cellar Masters, with large cellars capable of storing 1 100 000 gallons of wine. The vintage of the State vineyards and experiment fields is taken to these cellars, where are to be found types of all the best wines of the country. The school course lasts for 5 terms. In order to be admitted the candidate must have successfully taken a two years' course in a vine-growers' school. The course is free, and poor and deserving students receive some assistance. Besides the cellar-masters' course at Budafok, there are travelling cellar masters who, at the request of the vine-growers, will visit their cellars and impart the necessary instruction for the systematic handling of the wine.

In addition to the schools, there are periodical courses organized by the State Inspectors of Viticulture which also serve to spread the principles of viticulture and of systematic wine-making.

The higher instruction devolves upon the Superior Course of Viticulture and Wine-making instituted at Budapest in 1892. To this are only admitted pupils who have passed through the Superior Agricultural Institutes.

We must also mention the Central Ampelological Institute founded in Budapest in 1900. Its work is divided into 4 sections: *a*) plant biology and pathology; *b*) chemistry; *c*) zymotechnology; *d*) practical vine-growing. The results of the experiments, researches, and scientific studies of the Institute are published in its Annals. In 1911, the Institute examined 3248 samples and wrote 4282 letters of information.

Amongst the Hungarian wines, the most celebrated and the best is Tokay (Tokaji asszu) which has a world-wide reputation and well deserves the name of "king of wines". Its natural sweetness is due to the fact that the grapes are allowed to dry on their stems.

"Szomordui de Tokay" is also an excellent dessert wine; it is not very sweet, but is strong, full-bodied and aromatic. The new Hungarian wine law of 1908 has delimited the Tokay-growing district, which only consists of the vineyards of 31 communes. This law insures to purchasers that the wine they buy in the Tokay district is the product of the region which is legally delimited.

Other vine-growing districts of Hungary also produce excellent dessert wines, and even in good seasons, natural sweet wines, but the quality of the last is much inferior to that of the Tokay wines. The Transylvanian wines made from Rhine Riesling, Sauvignon and Semillon are especially remarkable; their quality rivals that of the celebrated Rhine vintages.

Hungarian wines have long been known abroad. The adjoining table gives some figures relating to the foreign trade in Hungarian wines and shows the quantity and total value of the must and wines exported and imported in casks and bottles.

Year	Exports	Imports	Exports	Imports
	Gallons	Gallons	£	£
1885 . . . .	23 337 336	1 975 168 (min)	1 072 907	600 656
1888 . . . .	32 846 814 (max)	3 521 408	1 521 226	984 836
1890 . . . .	29 471 794	5 065 192	1 946 500	1 155 425
1892 . . . .	15 898 102	15 951 056	1 428 545	1 070 625
1895 . . . .	17 158 020	10 957 072	1 634 977	848 075
1897 . . . .	17 239 552	28 969 418 (max)	1 447 899	1 282 896 max
1899 . . . .	13 415 732 (min)	27 107 900	1 128 215	1 220 773
1900 . . . .	16 258 176	20 063 076	1 377 969	1 019 010
1905 . . . .	18 290 602	8 078 554	1 227 798	392 677
1908 . . . .	21 989 792	7 659 212	1 199 106	381 160
1911 . . . .	31 467 634	4 844 686	2 394 822	399 590
1912 . . . .	32 817 136	7 446 736	2 892 894 (max)	632 197

The gradual diminution of the exports since 1888, in which year they attained their maximum, is chiefly due to the ravages of phylloxera which much reduced the grape crop. Between 1900 and 1908, the exports again showed a tendency to increase; in 1912 they reached 32 817 136 gals., worth about £2 892 894, which is greatly in excess of the value of the wine exported in preceding years. As for the imports, they increased considerably from 1891, and attained their maximum in 1897; this must be attributed partly to the perceptible decrease in the national production, and partly to the effect of the commercial treaty concluded between Austria-Hungary and Italy.

According to this treaty, which came into operation in 1892, and was in force until 1904, the contracting Powers reciprocally reduced the duty on all wines entering the country in casks, viz: Italy reduced the tax from 8.65*d* to 2 ½*d* per gal. and Austria-Hungary in the case of some classes of Italian wines, from 18.17*d* to 2.9*d* per gal. Nevertheless, owing to the rapid increase of vineyard reconstitution, the importation of wine continued decreasing, and in 1912 was only 22 per cent. of the exportation.

Lately, the Government has also been engaged in providing the vine-growers with facilities for the sale of their wines and the increase of their prices. For this purpose, it has decided to establish in the chief vine-growing districts of the country 10 large national cellars where the producers can deposit, handle and sell their wines. Most of these cellars will be open from 1913.

The production of dessert grapes has of late years received a great impetus. The following table gives some figures respecting the foreign trade in this fruit.

Year	Exports	Imports	Exports	Imports
	cwt.	cwt.	£	£
1886 . . . . .	93 922	2 073	64 106	1 747
1890 . . . . .	104 526	3 580	106 454	4 285
1895 . . . . .	51 478	13 267	65 270	23 546
1900 . . . . .	87 036	41 511	73 590	32 032
1905 . . . . .	218 486	25 782	144 186	17 514
1908 . . . . .	290 706	15 993	183 830	6 947
1910 . . . . .	155 622	8 659	147 347	7 197
1911 . . . . .	221 386	8 418	209 997	7 363

The manufacture of sparkling wines and of brandy (cognac) is also considerable. In 1911, 265 166 gals. of Hungarian brandy, worth £104 752, and 96 580 gals. of sparkling wines, valued at £25 984 were, exported. On the other hand, in 1911, 42 440 gals. of brandy, worth £29 454, and 103 026 gals. of sparkling wines, worth £59 211, were imported into the country.

Hungary, which is jealous of the good reputation of its wines, takes severer measures for the repression of fraud than most other wine-producing countries. The first Hungarian law concerning wine adulteration was promulgated in 1893, abrogated in 1908 and replaced by a new law (law XLVII of 1908 which came into force on January 1, 1909). The most important provisions of the latter are concerned with the prohibition and restriction of the addition of alcohol and of sugar. The salutary effect of this legislation has already begun to make itself felt. Statistics also prove, as we have shown, that there has been a considerable increase in the export of Hungarian wines and of their price during the four years that have elapsed since the new law came into force, which is a proof of the increased confidence felt abroad in the wines of Hungary.

## The Present State of the Question of Inbreeding in Germany

by

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The term "inbreeding" (Inzucht) was formerly frequently used to mean breeding of pure races (Reinzucht or Rassenzucht), whilst today it is limited to the persistent pairing of nearly related individuals. And while a further extended inbreeding ends in becoming a simple breeding of a pure race, still it is always desirable for the greater clearness of the whole question that under the term "inbreeding" the blood relationship be clearly understood. For consanguineous breeding in the narrowest sense the German breeders continue to use term "incest" (Inzest).

According to passages of Aristotle and Ovid it appears that the ancients did not scruple to practise the closest consanguineous unions. From the middle ages but few documents have come down to us containing the views of breeders on the subject; and while some writers recommend inbreeding others pronounce against it. In horse breeding it may often have been employed according to a well-thought-out plan, but in general the conditions of the middle ages were not adapted to the application of carefully studied principles. The frequent cases of inbreeding occurred without any system being followed, out of sheer ignorance of its dangers, or of indifference and also from the impossibility of changing certain conditions.

In England, as is well known, systematic inbreeding was largely used with the object of forming improved breeds endowed with certain qualities; but it would be an error to believe that in England the system had no opponents or that it was always attended with success. Notwithstanding the greater experience of English breeders and the extension of pastures favoured by the climate, there has been no lack of warnings raised in England against the evil consequences of inbreeding. And while, for instance, CULLEY was convinced of the innocuity of properly conducted inbreeding, JOHN SINCLAIR, PRINSEP, SEBRIGT and others insisted that continued inbreeding would be followed by debility, disease and sterility.

In France, also, the chief breeders have expressed their opinion on the question. SANSON recognises in inbreeding a powerful means of improvement, CORNEVIN communicates a whole series of facts of his own experience and in the main is not inclined to take the dangers of inbreeding too seriously. On the other hand BARON believes that a too long continued use of close breeding leads to sterility. On the whole the opinions of the leading men in France seem to differ quite as much as they do in Germany. At present, however, there is no doubt that in the matter of thorough research for the

elucidation of the question the greatest progress has been achieved in Germany.

It is beyond discussion that in the old times of German stock breeding inbreeding was not at all discountenanced. The former tendency laid great stress on complete purity of breed and looked askance at crossing. In such a state of affairs frequent inbreeding was the result and it was approved of even among the nearest relations (In zest), provided it was practised among perfectly sound animals. Owing to the partially very good results obtained by crossing with English blood, the theories of pure breeding and of constancy were shaken, and inbreeding which was one of the main points of the programme fell into undeserved discredit. Stress was laid upon the unsuccessful results which inevitably follow on haphazard inbreeding, and which in Germany were all the more to be expected as almost everywhere stall keeping prevails and the interests of agriculture are predominant. Finally the great value of a national building up of blood by inbreeding was no longer recognized, and even now it appears that in buying breeding stock more stress is laid upon the absence of consanguinity than upon any other point. There came a time in which the individuality was considered more than anything else, and the science of form underwent a far-reaching development. The performance tests followed, and now-a-days there is a partial return to the ideas of the old views on the constancy of characters which laid so much value on the ancestry. Only that the latter is now, more than in previous decades, connected with inbreeding and the care bestowed upon certain lines of blood.

This development need not convey the impression of gropings in the dark. The development of individual examination was certainly not useless, and the sharp insight of the breeder can never be replaced by pairing according to tables of pedigrees. Anyhow it is too radical to maintain that it is impossible to draw any conclusion as to performance and breeding value from the outer appearance of the animals. The pedigrees point out the way to a systematic building up of the breed, but for judging the value of an animal the decision will always be given by the outer conformation and by the performance.

It may be that the great importance attributed by breeders to ancestry and pedigree may be due to studies on human conditions. Genealogy, which has become a special science, seeks and examines the descent and family relations of men, making use of chronicles, ecclesiastical records, lists of corporations and the like. Many historical events become psychologically intelligible only when the families (together with their characteristics) of the principal actors are known.

Genealogical science has also investigated inbreeding, and very important knowledge has thus been gained. In the first place researches on individual families have shown how tenaciously certain traits are inherited, and how important it would be in contracting marriage to possess ample knowledge of the respective families. The works of REIBMAYER, SOMMER, ZIERNER and others are of the greatest interest in this connection.

COUNT VON LEHNDORFF will always have the merit of having been the first in his *Handbuch für Pferdezüchter* (Handbook for Horsebreeders) to illustrate by means of painstaking work and the necessary proofs, the bearing of inbreeding and breeding by families in the raising of horses. He thus showed the way to be followed in applying to other kinds of animals a great part of what he had discovered in the breeding of Thoroughbred horses. The severe strain upon the constitution which is afforded by racing is already a selection of all those animals which are best adapted to stand the injurious effects of inbreeding. Similarly, in breeding half-bloods, the conditions for obtaining health and a good constitution are in general more favourable in horses than in other animals.

Nevertheless Herr V. OETTINGEN, who has studied further the question of inbreeding in the light of his ample experience, and also from a theoretical point of view, insists that close inbreeding frequently maintains its evil consequences. In his book *Zucht des edlen Pferdes* (Breeding of Thoroughbred Horses) he says "unfortunately many successes are recorded in the Trakehner Studbook when inbreeding closer than that of one "free generation" (1) was used. A weak, delicate constitution, light bones, and sterility have also been among the Trakehner half-bloods the consequences of inbreeding pushed too far. With a natural breed endowed with more robust constitution, such as the Steppe breeds, close inbreeding with one or no free generation, may be practised without any bad consequences for a greater length of time than with the improved breeds. Indeed even within the improved breeds the more robust, e. g. the Thoroughbreds, as said above, seem to stand close inbreeding better than most half-bloods, especially those too delicately nurtured. The old experience that continued inbreeding may lead at last to serious drawbacks must not be considered too lightly by modern German breeders.

Dr. DE CHAPEAUROUGE, of Blankenese near Hamburg, is a medical man who has devoted himself to the study of inbreeding and has recently taken a foremost position in the investigations on the pedigrees of domestic animals. His book on inbreeding (Rademacher, Hamburg) treats the subject exhaustively, and the whole present movement is intimately connected with his name.

GUSTAV RAV in his book *Die Not der Deutschen Pferdezucht* (The Requirements of German Horse-breeding) has demonstrated how valuable inbreeding has been in the development of all our half-blood breeds. For several years past the "Deutsche Gesellschaft für Zuchtungskunde" (German Assoc-

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(1) Instead of the English word "remove", Count Lehndorff uses the German words "freie Generation" the sense of which differs somewhat from the former.

In order to count the removes between a given animal and one of its ancestors represented both on the paternal as well as on the maternal side, each generation on either side is counted separately, including the parents of the animal in question.

On the other hand in counting the "free generations" the sire and dam are omitted and the other generations are counted together both on the sire's side and on the dam's.

(Ed.)

ciation for the science of breeding) has exerted itself, together with Dr. De Chapeaurouge, in the investigation of the nature and effects of inbreeding and in the efforts to render the importance of systematic progress in this direction clearer to the breeders. The collection of pedigrees that Dr. De Chapeaurouge already possessed has rendered possible the institution of a special archive for the investigation of ancestors and of inbreeding. Courses of instruction have been started and the Society has besides undertaken to supply pedigrees for the animals of certain breeds. In a special pamphlet the Society has proposed a uniform form and mode of entry for pedigrees so as to render them easier to read (1). These proposals deserve to be taken into consideration and they will doubtless lead to a more general recognition of the importance of breeding by families and by certain lines of blood.

How does the question stand at present in Germany? In horse-breeding, as has been said above, Count LEBENDORFF and v. OETTINGEN are at the head of the movement and their decisive investigations have demonstrated that the prospects of success with inbreeding are most propitious with about 4 free generations. When in the improved conditions of a district provided with pure-bred animals, the best are always used for breeding purposes, the result is that the most valuable races become better known and esteemed, and inbreeding gets introduced by itself. As on the other hand too close inbreeding is feared, very likely the approximately right proportion will be found by practice. This has proved true in the systematic investigation of descent in the most varied fields of breeding and holds good not only for Thoroughbred horses, but also for Rhenish draught horses, as has been fully demonstrated by Dr. FRIZEN's recent work on their most important lines.

In the breeding of cattle under present conditions, especially in peasant farms a great deal of inbreeding is practised and the mischief is often unmistakable. On the other hand, here also often a systematic and well calculated inbreeding is carried out, and it appears to be an excellent means of improvement. Unfortunately in the German Empire the investigation on inbreeding in cattle cannot be everywhere sufficiently pursued because the keeping of herdbooks is comparatively too recent. But in the districts where Shorthorns are kept and in East Friesland better conditions obtain, and for the East Prussian breeding PETERS has produced a fine work on the use of inbreeding and the breeding of certain lines of blood. It appears that here also, as in East Friesland and in Schleswig-Holstein, the blood of certain remarkable ancestors has a special significance and that the success in breeding depends to a great extent upon the continued connection with these lines.

In the breeding of pigs, inbreeding was formerly almost generally avoided and, considering the prevailing custom of keeping them in sties, it was quite right to do so. Recently, however, it is sufficiently well known to what extent breeders practice inbreeding and the systematic breeding

(1) See No. 546, B. May 1913.



(Ed.).

by lines. Thus, for instance, HOESCH has pointed out that in breeding the improved Neukirchen pigs, the inbreeding of specially strong animals gives an offspring possessing unfailing good growth, high powers of utilizing food and fine shape.

As for sheep breeding there is no doubt that in England as well as in Germany, much use has been made of inbreeding. Recently Dr. SCHMEHL, in part 15 of the publication of the "Deutsche Gesellschaft für Züchtungskunde" (German Society for the science of breeding), contributes an investigation on the conditions of breeding in the Zemlin Rambouillet flock, and here also it appears that most of the animals are the result of a decidedly close breeding. If frequently the objection is raised that excellent sheep flocks have been ruined by inbreeding, the accompanying circumstances should be looked into. In a preceding paper I have shown that at the time when all efforts were directed to the production of very fine wool, they led to a general refinement of the whole body of the sheep. It is evident that the bodies thus rendered delicate were not the most suitable for inbreeding, though on inbreeding in itself this cannot be considered as an equitable verdict. (1).

Especially remarkable are the observations that refer to systematic inbreeding for the production of exceptionally fine sires or good dams. BRUCE LOWE, in his work on the breeding of racehorses, upholds the principle that excellent stallions can best be obtained when the sire is paired with a mare who possesses in her line some famous individual which is found also among the maternal ancestors of the same sire.

An instance of such a pedigree is furnished by the genealogy of "Araber", a Thoroughbred of the Württemberg Oriental stud at Scharnhausen (after Adlung).

Araber	Salamander	Doge	
		Sarah	Amurath 
	Amadine	Padischah	
		Amourette	Amurath 

(1) Die Kontroverse über Rassen-Konstanz und Individualpotenz, Refuzucht und Kreuzung. Berne, K. J. Wyss, 1905.

HOESCH has made some observations in his herd of native improved pigs at Neukirchen which tally perfectly with Bruce Lowe's opinion. According to this method of pairing a whole series of very good boars was obtained. The pedigree of one of them, "Nero", is here given as an illustration.

On the other hand excellent dams were obtained by a composition of the strain in which the remarkable ancestor, as basis of the inbreeding, is found not only on the mother's side but also in the paternal series of ancestors of the sire. An instance is afforded by the pedigree of "Ruhe",

<i>Nero</i> D. L. G. III. Prize	2059 III. Prize	883 N. D. L. G. Ia, Ia, Ia Prize	925 <i>Richard</i> D. L. G. Ia, III, I Prize
		Herronin	
	Naturkraft	883 N.	925 <i>Richard</i> D. L. G. Ia, III, I Prize
		Kraft	

<i>Ruhe</i> D. L. G. IV, II, III Prize	3283 D. L. G. I Prize	1850	884 <i>Richard</i> Ia, III, I Prize.
		Riese	08 <i>Richard</i> Ia, III, I Prize.
	Rudhard	015	
		Rubin D. L. G. II Prize	St. 4 <i>Richard</i> Ia, III, I Prize.

We may safely say that in Germany in all the important branches of stock breeding the question of inbreeding is being most actively studied. In-

stead of entertaining opinions, views and prejudices, the tendency is to form a solid foundation of facts. These efforts have a far-reaching importance and in all cases when the herd books have allowed it they have obtained valuable results. It has been found everywhere that really important breeding animals always belong to families in which the excellence of their blood is especially due to a few preeminent ancestors, and when this is recognized the real value of inbreeding and of lines of blood is put in its true light. Consequently no expert would think of recommending a careless use of inbreeding, and the great number of insuccesses of the method, even in the hands of good breeders, is not denied by any one.

On the whole the present tendency is towards emphasizing selection, a more rigorous picking out of favourable hereditary variations. Those also who believe in the heredity of the good qualities and improvements that animals acquire through being well cared for must admit that in the great number of animals there are only a few that transmit with certainty to their offspring their special traits of form and of performance. It may be that these qualities derive from favourable modifications of the germ plasm of the parents. The connoisseur's judgment for the beauty of the animal, and the tests for its performance must be increasingly applied in connection with breeding according to pedigree, in order to spread throughout the breeding districts the high quality of the blood of certain animals by the greatest possible utilisation of inbreeding. How it happens that of these animals possessing remarkable qualities only a few are capable of producing important results in consanguineous breeding and in breeding by families, while others completely fail to do so, is a question that at present is shrouded in obscurity. Some light could perhaps be soonest thrown on the question by researches in sheep breeding, for the flock books give an idea of the conformation and of the build of the animal in relation to its resistance. Here I agree fully with C. LEHMAN, who, in No. 16 of the *Deutsche Landwirtschaftliche Tierzucht* of this year, regrets that Dr. SCHMEHL had not extended his investigations in this direction also. It might perhaps have been shown how often the insuccess of certain animals is due to a weak constitution and how far it may be due to other causes. Such causes might appear to be that the blood of the unsuccessful animal on which the inbreeding was based (basis of inbreeding) was not yet sufficiently fixed, or the case might be led back to the above-mentioned question, namely whether the merits of the basis of inbreeding derive from favourable variations of the germ plasm (are blastogens) or from better conditions of environment (acquired qualities). In the latter case heredity could tell less.

Be it as it may, practical breeding can hope for great results from the present aims and methods.

From a biological point of view however, it would be of the greatest importance if the question of inbreeding among the various animals were studied in connection with the theory of chromosomes. Probably very useful results would be obtained.

## BIBLIOGRAPHY ON INBREEDING.

- CH. DARWIN, "Variation of Animals and Plants under Domestication".
- G. CULLEY, "Observations on Live Stock" etc. London, 1794.
- J. SINCLAIR, "Code of Agriculture," 5th Edition. London, 1832.
- PRINSEN, Cf. T. A. KNIGHT, "Comm. to the Board of Agriculture", Vol. 2.
- SEBRIGT, "The Art of Improving the Breed", etc. 1809.
- SANSON, "Traité de Zootechnic." Paris, 1896.
- CORNEVIN, "Traité de Zootechnie générale" Librairie Baillière, Paris.
- REIBMAYR, "Die Entwicklungsgeschichte des Talents und des Genies," Vol. 1, 1908. J. F. Lehmann, Münich.
- SOMMER, "Familienforschung und Vererbungslehre," Barth, Leipzig.
- ZIERMER, "Archiv für Rassen- und Gesellschaftsbiologie", 1903.
- G. GILF, LEENDORFF, "Handbuch für Pferdezüchter", 5th Edit. Paul Parey, Berlin.
- B. V., OETTINGEN, "Die Zucht des edlen Pferdes". Paul Parey, Berlin.
- DE CHAPEAUROUGE, "Ueber Inzucht". Rademacher, Hamburg.
- G. RAU, "Die Not der deutschen Pferdezucht".
- FRIZEN, "Die wichtigsten Blutlinien des rheinischen Kaltblüters". M. & H. Schaper, Hanover.
- PETERS, "Ueber Blutlinien und Verwandtschaftszuchten", etc. Schaper, Hanover.
- HOESCH, "Die Inzucht und die Pflege der Blutlinien im praktischen Zuchtbetrieb" — *Deutsche landw. Tierzucht*, Year 12, Nos. 19, 20 and 21.
- SCHMEHL, "Inzuchtstudien in einer deutschen Rambouilletstammschäferei." Part 15 of *Arbeiten der Deutschen Gesellschaft für Züchtungskunde* Schaper, Hanover
- H. KRAEMER, "Die Kontroverse über Rassenkonstanz und Individualpotenz". K. J. Wyss, Bern, 1905
- H. KRAEMER, "Aus Biologie, Tierzucht und Rassengeschichte", Vol. 2. Eugen Ulmer Stuttgart, 1913.

## Utilization of Skimmed Milk as Food for Calves. Summary of Experiments carried out on 60 Calves.

by

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One of the first subjects to which I devoted my attention on assuming the directorship of the Zootechnic Institute of the Royal Agricultural College in Milan was to make investigations with the object of solving the following problem: which is the best way, for Lombardy, of utilizing skimmed milk in the feeding of calves. In this connection between 1905 and 1911 I carried out seven series of experiments on 116 calves divided into several groups, to each of which I gave skimmed milk mixed respectively according to a special plan, with rice-flour, maize meal, potato starch, oleo-margarine, whole milk, oleo-margarine and potato-starch, chestnut

flour, potato-starch treated with diastasoline (1) and lastly with oleo-margarine and potato-starch treated with diastasoline or with levuline (2).

As may be seen from the reports published in Vols. VI, VII, VIII, IX and X of the *Annuario della Istituzione Agraria Dr. Andrea Ponti*, attached to the Royal Agricultural College in Milan, the best physiological and economic results were obtained from calves fed with skimmed milk, oleo-margarine and starch treated with diastasoline or levuline. These calves were 60 in number, belonging to five series of experiments, four of which were carried out by the Zootechnic Institute and one in the stables of D. F. Sigurta at Comabbio (Como), always following nearly the same general rules. Here I shall, in the first place, describe these rules and the conditions under which the various experiments were conducted, and then I shall summarize the physiological and economic results obtained.

The 60 calves before being subjected to the experiments were carefully examined, especially as to their health and hardiness; nevertheless some of them became sickly a few days after being placed in the stables, but they soon recovered and did not in any way disturb the course of the experiments.

Every calf was kept after its birth or purchase on the three following successive diets: 1. whole milk; 2. transition diet during which the whole milk was gradually replaced at the rate of 1 litre (nearly 1 quart) a day by skimmed milk mixed with oleo-margarine and starch treated with diastasoline or levuline; 3. economical diet, that is skimmed milk, oleo-margarine and starch treated as above. Besides, 11 calves were given small quantities of linseed cake during the last 10 or 15 days of the experiment in order to see if it were possible to force the animals to finished fattening in less time. The duration of the first diet, depending chiefly upon the degree of hardiness of the calves and their weight, ranged between 1 and 33 days and in the greatest number of cases, between 15 and 26 days. The second or transition period — at the beginning of which the weight of the calves ranged from 110 to 191 lbs., and in most of them between 121 and 136 lbs. — varied from 6 to 8 days. The third period, that of the economical feeding, lasted from 14 to 70 days, most frequently being from 1½ to 2 months. The total duration of the individual experiments in the greatest number of cases was 2 months to 2½ months: only in 4 cases they lasted respectively 90, 102, 103 and 106 days.

The food given was analyzed in the Laboratory of Agricultural Chemistry of the Royal Agricultural College of Milan.

The doses of oleo-margarine and of starch added to every gallon of skimmed milk in order to bring it up again nearly to what it was before

(1) Diastasoline is a saccharifying substance that the Deutsche Diamalt-Gesellschaft of Munich extracts from malt.

(2) Levuline is a product of the « Distillerie Italiane » Company, at Padua; it has a fairly high power of transforming starch into dextrine; its saccharifying power is rather low. It is used by bakers to hasten and complete the action of yeast and to obtain a better quality of bread.

being separated were determined by considering the results of chemical analysis and those obtained from calves submitted to preliminary tests. The doses were thus fixed: 4 oz. of starch and 3.2 oz. of oleo-margarine for 36 calves; 4 oz. of each for 20 calves; and respectively 4.8 oz. and 3.2 oz. for 4 calves. The quantity of linseed cake added to the other food for 11 calves was 1.76 oz. for a couple of days; this was successively raised by 1.76 oz. at a time up to 5.3, 7 and 10.6 oz. according as the linseed was relished.

The determination of the quantity of the rations was made taking into account the appetite and the daily gain in weight obtained by weighing

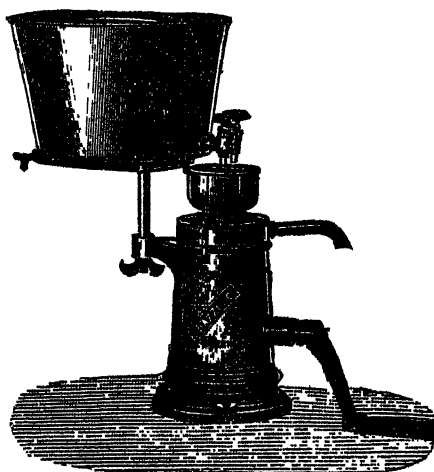


Fig. 1. — Bazzi's Emulsifier.

the calves before the morning feed. The increase in weight is the safest test, both for the sufficiency of the ration and for detecting if there is anything wrong with the health of the animals.

The quantity of whole milk, or of skimmed milk mixed with other foods, given daily when the animals were in good health, beginning from a week or two after birth or purchase ranged between  $\frac{2}{6.1}$  and  $\frac{2}{13.4}$  of the weight of the animal.

In the preparation of the rations the following system was followed: the starch was mixed with an equal weight of cold skimmed milk, then boiling or nearly boiling skimmed milk was gradually added and continually stirred, the quantity being seven times the weight of the starch. The jelly-like liquid was allowed to cool to 122 to 140° F. and then diastoline previously dissolved in some tepid water was added to it at the rate of 10 per cent. of the weight of the starch, or levuline (at the rate of 30 per cent. of

the starch) dissolved in an equal quantity of skimmed milk at the temperature of 122 to 140° F.; lastly when the mixture had become liquid it was added to the rest of the skimmed milk in which the dose of oleo-margarine had been emulsified by means of Bazzis' emulsifier (Fig. 1).

The rations were given in Zappa-Pirocchi's sucking-pail (Figs. 2 and 3) at a temperature of 93 to 95° F. During the first days of the first period of the experiments, *i. e.* during the whole-milk feeding period, the rations were given three times a day, excepting in some cases in which the whole milk was given four and six times and even more on account of intestinal troubles. In the second and third periods, with but few exceptions, the feeds were given only twice a day.

The stables in which the 49 calves were kept, though not perfect from a hygienic point of view, were fairly good. They have a good aspect and are sufficiently large to counteract the ill-regulated ventilation; the temperature during the experiment ranged from 53.6° F to 64° F; the light was conveniently moderated so as to keep the calves in semi-darkness; the pavement, which is slightly inclined, is of cement, and the walls of the stable are lined with cement up to a height of 52 inches from the ground; the stalls are separated from each other; some are 66 by 52 inches, others 76 by 52 inches. Very different are the shelters in which the remaining 11 calves were kept. Nine of them were placed in an old shed, exposed to the south, measuring 1942 cub. feet, and imperfectly ventilated; it was very warm and on some days the temperature reached as high as 86° F. in the afternoon. Lastly the remaining two calves were put together with cows and other animals in a large stable in which—owing to the unfavourable aspect of the building, to defective ventilation and to changeable weather—the thermometer had a wide range, from 63° up to 93° F.

In order to prevent the calves taking exercise, they were tied up short to the stalls; and to prevent them eating the straw of their litters they were kept always muzzled except at feeding time, after which their muzzles and lips were cleaned with a cloth.

Especial care was bestowed upon the cleanness of their coats; every morning before feeding they were groomed down and those parts that were soiled by excrements were washed and dried.

The physiological results of every series of experiments were deducted from observations carefully made with the object of determining: the influence of the various feeds upon the health of the calves; the increase of weight, total and daily, of each calf during the three diets and during the whole experiment; the quantity of food consumed by every calf in the above periods, and per pound of gain in live weight; the character of the flesh and the net yield in butcher's meat.

As for the economic results the following were calculated: the cost of one pound of gain in live weight, for each of the three diets and for the whole duration of the experiment, in comparison with the cost of the

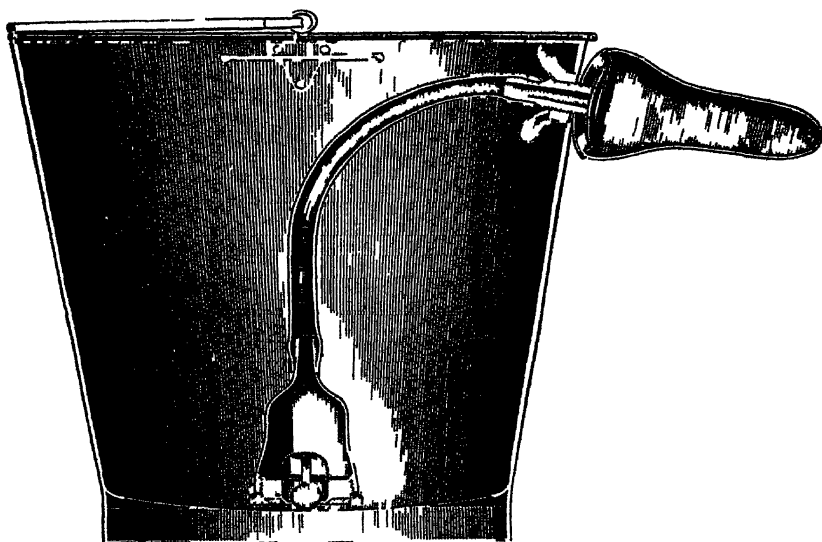
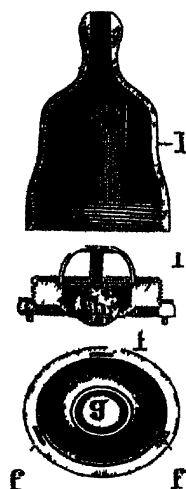


Fig 2 — The Zappa-Pirocchi sucking pail, fully equipped



- f) foot on which the apparatus rests,
- g) circular aperture through which the milk passes on being sucked,
- h) rubber ball which, rising and falling during suction, opens and shuts the circular aperture g,
- i) cage for rubber ball,
- l) upper part of apparatus, which screws onto the foot, while its top is connected with the rubber tube leading to the artificial teat.

Fig 3. — Section of the valve apparatus in the Zappa-Pirocchi sucking pail



same gain in calves fed only with whole milk; the price which a gallon of skimmed milk fetches when utilized by the calves (1).

*Health conditions of the calves.* — During the whole-milk diet one calf suffered from a rather serious scour, which ceased after a few days by treatment with small rations of milk mixed with lime-water and laudanum; another calf fell ill of pleuro-pneumonia and soon recovered, but traces of the disease were found when the animal was slaughtered. During the transition period only one calf — among those which were fed on skimmed milk mixed with oleo-margarine and starch treated with levuline — had some gastro-enteric trouble accompanied by scouring and loss of weight; consequently the calf was fed again upon whole milk in small and frequent doses (three or four a day), but after about a week was again submitted to the transition diet and afterwards to the economical ration without any inconvenience. During the third diet, health conditions were good, except for three calves — among those that were fed skimmed milk with oleo-margarine and starch treated with diastasoline — one of which was seized with pleuro pneumonia after one month from the beginning of the economical diet and had to be sold immediately; the other two suffered slight and brief intestinal troubles with excretion of soft and acid-smelling faeces in one case, and whitish hard and foetid faeces in the other. It is also to be mentioned that 10 calves — 8 of which were subjected to the skimmed milk, margarine and starch treated with diastasoline diet, and 2 to the skimmed milk, margarine and starch treated with levuline diet — showed themselves poor feeders, leaving portions of the morning or of the evening feed; it was ascertained that in 5 of these calves the fact of their leaving part of their ration — even of whole milk — was not due to any health trouble or to the quality of the food, but only to habitual lack of appetite; whilst for the other 5, the refusal to finish their food was due to the linseed cake which gave an unpleasant odour to the rest of the food and for this reason its use was discontinued.

*Increase of weight.* — The following figures show the average daily gain in weight.

In the first period, whole milk. . . . .	1.54 lb.
" second period, transition feed. . . . .	2.17 "
" third period, skimmed milk mixed with oleo-margarine and starch treated with diastasoline or levuline . . . . .	2.00 "
" whole experiment . . . . .	1.91 "

The small gain obtained in the first period, during which the calves were fed whole milk, is due to the fact that many cattle men have the deplor-

(1) For the method adopted in these calculations see my reports on skimmed milk in the feeding of calves, in Vols. VI, VII, VIII, IX and X of the *Annuario della Istituzione agraria Dr. Andrea Ponti*, published by the Royal Agricultural College in Milan.

able habit of giving the calves as much milk as they can swallow on the morning of the sale, in order to make them weigh more; the result is that to avoid serious gastro-enteric troubles they must be kept on short rations for a few days, giving them only small quantities of milk. This causes a slackening in the live weight gain and sometimes even a loss during the five or six days following the sale; this diminution is only partly compensated by the successive normal increase. This is the chief reason for which the average increase observed during the first period cannot be compared with the gains made during the other periods so as to form an idea of the respective advantage of the whole milk and of the skimmed milk, oleo-margarine and starch feeds. In order to determine this, another comparison can however, be made. In carrying out the first series of experiments 4 calves were fattened on whole milk, — keeping them in the same conditions of stabling, grooming, etc. as 49 calves out of the 60 experimented upon — in order to demonstrate that there was only a slight, if any, economic advantage of this method of feeding. On comparing the average gain obtained in the time between the birth or purchase and the sale of the 4 calves (1.87 lb.) with those obtained in the 2nd and 3rd periods and during the whole experiment (2.17, 2.00, 1.91 lb.), it will be seen that the gains in weight of the calves fed according to the method set forth in this report were considerably superior to those made by the calves fed on whole milk. To this assertion however no excessive weight must be given, because there are some calves that present still higher gains from whole milk feeds, but such is not the general rule, while many are the calves that on whole milk diet make about the same gains as those fed prevalingly on skimmed milk with the addition of oleo-margarine and starch treated with diastasoline or levuline.

*Food consumed.* — The average quantities of whole or skimmed milk consumed by the calves for every pound of live weight gained are shown in the following table.

In the 1st period:		whole milk, . . . . .	8.610 lbs.
" 2nd "	{	whole milk. . . . .	3.870 "
		skimmed milk . . . . .	3.950 "
" 3rd "	"	" " . . . . .	10.341 "
During the whole experiment:	{	whole milk. . . . .	2.029 "
		skimmed milk . . . . .	7.660 "

If these figures be compared with those giving the quantity of whole milk that is considered necessary to obtain 1 lb. of gain during the first two months of the calf's life (from 10 to 12 lbs.) the following interesting fact is observed: that the average quantities of whole and skimmed milk consumed by the calves during the 2nd period and during the whole experiment and that of skimmed milk consumed during the 3rd period have been nearly equal, and even inferior, to the quantity of whole milk required for the same increase of 1 pound.

*Character of the meat.* — With the exception of one cow-calf of the Simmenthal breed — which, for its handsome appearance, was bought, at the age of 103 days, when it weighed 297 lbs., for breeding purposes by the agents of the Hon. Senator Marquis Ettore Ponti's estate — all the calves were sold to the butcher and of each of them the quality of the meat was observed.

According to the above observations the 59 calves can be divided into two groups. To the first belong 43 whose quarters in general had a good appearance, with white firm close-grained flesh; the second is composed of the remaining 16 calves, whose flesh was reddish and more or less soft. As for the fat it was white, of proper firmness and abundant under the skin and about the kidneys, in 37 calves: in the remaining 22 it was dirty white and not so plentiful, especially about the region of the kidneys which was only partly covered by fat.

The judgment pronounced on the meat, which was cooked in various ways, was, with the exception of a few carcasses, that it was good and sometimes excellent.

It is to be mentioned that as for the quality of the meat several calves fed on skimmed milk with adjuncts were in nowise inferior to those fed on whole milk; this also was the opinion of the butcher, who declared himself pleased with his purchases.

*Carcase weight.* — The net carcase weight at the slaughter house — calculated according to the custom of the trade at Milan, by weighing the animals diminished only by the weight of the blood, stomachs and intestines — averaged 76.03 per cent. it ranged from 67.29 to 84.64 per cent. of the live weight.

*Cost of the gain of 1 pound live weight;* — The following are the costs per pound of gain in live weight:

In the 1st period: whole milk . . . . .	5 66 "
" 2nd " transition . . . . .	4 02 "
" 3rd " skimmed milk with adjuncts . . . . .	3.89 "
During the whole test . . . . .	4.19 "

A simple inspection of these figures shows the considerable difference between the cost of 1 pound of gain in calves fed on whole milk and that of those fed on skimmed milk with adjuncts. But here also it must be repeated that the figures of the first period cannot be rigorously compared with those of the other periods also for the reasons previously given. Anyhow if it be admitted, as is generally believed, that during the first two months of the life of a calf an average of 10 lbs. of whole milk is required to form 1 lb. of gain, and if the milk be valued at the average price of 6.61d per gallon, which was current during the time the experiments lasted, it results that by feeding whole milk from birth to the time of selling, the average cost of one pound of live weight would be about 6.56d. that is somewhat higher than the average 4.19 d calculated for the 60 calves on the basis of prices which for the various foods given are anything but

low: oleo margarine, £2 12s 6d to £2 16s 6d per cwt.; starch, 14s 3d to 18s 6d per cwt.; diastasoline, £2 16s 6d to £3 0s 6d per cwt.; levuline, £2 0s 6d to £2 8s 6d per cwt.

*Prices realized for the skimmed milk through the calves.* — This price averaged 4.97 d per gallon. But it must be mentioned that in determining it the cost of the other foods consumed by the greatest numbers of calves was calculated at rather high prices and that several of the best calves had to be sold at an unfavourable moment when the prices were low. In some cases, however, the prices realized for the skimmed milk were considerably above the average, reaching as much as 6.45 d, 6.76 d and 7.56 d per gallon. These prices are in part due to the fact that in general the calves were sold at rather high prices; though it is also true that the purchase prices of the calves were higher than usual, as well as the prices of the foods used.

On the basis of the above physiological and economic results it may be concluded:

1. — *That skimmed milk mixed with oleo-margarine and starch treated with diastasoline or with levuline may be advantageously employed as food for calves destined for the butcher, according to the methods set forth in this report.*

2. — *That for the so-called reintegration of every gallon of skimmed milk the following quantities may be recommended: 3.2 oz. to 4 oz. of oleo-margarine and 4 oz. of starch; and 1.6 oz. of diastasoline or 4.8 oz. of levuline for the treatment of 1 lb. of starch.*

## Wheats from the British Millers' Point of View

by

A. E. HUMPHRIES,

*President 1906-07 National Association British and Irish Millers,  
Chairman of its Home Grown Wheat Committee*

Within the last 30 years, the British flour milling industry has been subjected to revolutionary development in two principal directions, one economic, the other technological. At the beginning of that period, there were 10 000 mills in the United Kingdom producing flour; today, the number is less than 1 000, although the quantity of wheat ground per annum is now 80 per cent. greater than it was 30 years ago. Furthermore, one third of the flour produced in the United Kingdom is made in about 30 large mills situated at seaports.

The following facts are associated with these developments.

a) The acreage under wheat in the United Kingdom has been greatly diminished, so that although the yield per acre has been increased substantially, the quantity of home-grown wheat, which 30 years ago was 36 per cent., is now only about 20 per cent. of our requirements.

b) The standards of excellence in flour have been raised, whereas the average quality of our home-grown wheat has been lowered.

c) The milling system of gradual reduction by means of roller mills has entirely superseded the use of millstones. The mills now existing are well equipped.

d) The development of new countries and the insufficiency of labour in most wheat-growing areas, have caused wheats to contain a substantial proportion of dirt, seeds and other extraneous matter, so that elaborate and costly installations of wheat cleaning machinery have been rendered necessary in our mills.

e) A system of "conditioning" has been elaborated whereby as a result of the skilful use of water, great improvements in the quality of flour, and great changes in the relative values of wheats have been made.

f) Under pressure of extreme competition, millers have to work on exceedingly small margins of profit per unit, and cannot afford to make mistakes in milling or tolerate irregularities in the quality of their manufactured goods.

The very small modern mill cannot secure optimum technical results, so the developments in technology were predisposing causes of its commercial extinction or of its enlargement. A miller who first adopts sound novelties in milling practice, incurs substantial risks, but secures adequate returns, so in the early days of roller milling, many inland mills were increased in size and yielded adequate profits, but when their competitors adopted the same novelties, the economic unsoundness of their position became apparent. Unfortunately, the necessities of our railway companies have greatly accentuated the difficulties of our inland millers. Our railway service is in some respects a very good one, but its rates for freight are high, so that an inland mill which had to depend for its supply of raw material and the distribution of its products upon railway transport could not compete with a mill, which, taking advantage of our relatively great seaboard, could avoid the use of railways in obtaining the wheat it required, and in distributing the whole or a large proportion of its products. The whole story concerning the decadence of our small country mills would be too long for this article, but this summary indicates the great determining cause of the economic revolution in our industry, whereby many inland millers had to close their mills and go out of business, or migrate to the ports, or restrict the size of their operations, so that they could obtain their raw material and distribute their products at a relatively low expense for transport charges.

This excursus upon economics is justified, because it will serve to bring out the reason for an apparent contradiction in these two statements, one that the British miller is willing to buy practically any wheat offered to him; the other that the National Association of British and Irish Millers has spent much time, through the instrumentality of its Home Grown Wheat Committee, in efforts to improve the quality, and more particularly the strength, of our home-grown wheats, whereby they shall be in the highest degree suitable for the commercial requirements of the

district in which they are grown. If they be not improved, the millers of the district will still be compelled to buy suitable foreign wheats, and a large proportion of the native wheat produced in our wheat-growing districts will still be transported at great expense either as wheat or flour to other districts. The railways will still gain by earning freight charges in both directions, but the grower, miller, and consumer will still have to bear the burden between them of the expenditure, which ought to be unnecessary. The Committee already knows that wheats of the highest quality can be produced in an ordinary season in this country, and its efforts are directed principally to obtaining new varieties of prime quality and high yielding capacity. When within a few years that object has been achieved on a large scale, port millers will doubtless seek to buy more wheats than they do now, but the same economic causes which helped them so greatly in the past, will favour the inland miller then, and there is in all probability a prosperous future before these inland firms, which are able to obtain their raw material locally and sell their products in the same district. The position of a firm well equipped with brains, money, and knowledge, operating on such lines, should be commercially impregnable.

The greater part of the flour consumed in the United Kingdom is used for bread making, but some is used for the making of cakes, pastry and puddings, some for biscuits, some in other industries. In some parts of England bread is made at home by housewives or their household servants, but in the greater part of this country, bread is made by professional bakers, who handle large quantities of dough daily. Ordinarily bread is made by means of panary fermentation; sometimes, for instance in some parts of Ireland, the aerating gas is produced by means of a chemical reaction between an acid and an alkaline body, such as sour milk or acid phosphates and carbonate of soda. For biscuit or pudding making the flour made from existing typical ordinary English wheat, harvested in good condition, is satisfactory, but the flour from such wheat is not sufficiently stable in the dough, or sufficiently "strong" to make satisfactory bread. Farmers and the great majority of inland millers would be better recompensed if we produced at home wheats from which good bread-making flours can be produced, even if we had to import a larger proportion of wheats from which good pudding and biscuit flours can be made. The point I specially wish to make at this juncture is, that wheats of widely differing characteristics are required by British and Irish millers.

My next point is, that market value is not a true index of intrinsic worth. No person, or Government Department, has set up in this country a standard whereby the intrinsic worth of a wheat or flour is to be judged, nor is any such action desirable, but certain characteristics in wheat are highly esteemed, and the trades concerned have come to regard the possession of certain qualities as a measure of intrinsic worth, principally because such wheats are generally in relatively small supply and usually realise maximum prices. A considerable amount of friction

must be used in milling, but the millstone applied an unnecessary amount of friction in an unnecessarily severe way. The public demands a white or bright coloured bread, and in these days of good wheat cleaning appliances, the principal cause of dark bread is the presence in low grade flours of an appreciable amount of bran powder. A wheat which is hard and possesses friable skin is more likely to be comminuted than a mellow one; bran powder from a "red" or brown wheat will darken the bread much more than the same percentage of bran powder from a "white" or yellow wheat. So 40 years ago, in millstone days, a wheat which was mellow, white and strong was considered excellent. Hence the high repute in which Dantzig, among foreign wheats, and Chidham, among native varieties, were held in those days. But with the advent of roller milling and imported flours made from wheats grown on the virgin lands of the United States and Canada, the older standards as to excellence of quality were changed, and we gradually came to recognise as specimens of high intrinsic worth, the better grades of Canadian and United States spring wheats, hard friable "red" skinned varieties, containing, a high percentage of nitrogenous matter. Such wheats have for many years realised ordinarily the maximum prices of our markets, but not invariably. For we want other types of wheat as well, and supply and demand are far more influential elements in price making than any current ideas as to intrinsic worth.

The upshot of these considerations is, that British millers do not seek to impose any conditions as to the type or characteristics of the wheats offered them. All sorts and conditions of well-harvested wheat have a value on our markets, and can be sold therein. We do, however, attach great importance to various points of excellence, and believe that the plant breeder can in most, if not in all countries, provide varieties, in the highest degree suitable to the "environments" existing there and to the commercial requirements of millers. British millers are to a greater extent than ever running their mills in a scientific way; some have scientists on their staff. The idea that wheat is sacrosanct is passing away; the newer conception is, that it is a fruit of the earth designed by Nature to be a seed and that in making it fit for use as human food the miller is right in obtaining not the only aid of the engineer, but of the chemist as well. With such aids he is the more disposed to make his own requirements subservient to the interests of growers. But he does ask that the arrangements made for marketing should in all countries be equitable. For instance if "grading" be established in any country, the methods adopted should be uniform throughout the area concerned, and provision should be made for rectifying any substantial errors which are made in practice. He also asks that the glaring malpractices existing in connection with Russian grain shipments should cease. Such abuses must in the long run be highly unprofitable to the perpetrators, for buyers can take effective means of resenting them. Nevertheless, as the recent history of the grain trade has shown, it would be better for all concerned that such evils should be rectified by the joint action of shippers,

merchants and receivers, with or without the co-operation of the Governments concerned.

The following points should be remembered by those wishing to sell wheats on our markets :

1) Bults should be uniform throughout, and the standard of quality, whatever it may be, should be maintained with a minimum deviation therefrom.

2) Wheats which contain the smallest percentage of dirt, rubbish and other extraneous matter and which yield the highest percentage of good flour with the minimum of risk and trouble to the miller, are those which he prefers. Their virtues have a cash value.

3) Nothing should be done to hide or disguise any imperfections or faults of quality. A miller is more likely to buy wheat of poor quality at a reasonable price than run unknown risks by continuing to buy, except at a very low price, wheat whose real qualities he is unable to recognize or appraise.

4) Ordinarily the colour of the bran is relatively unimportant, but preference should be given to white wheat. In this connection, it should be remembered that white wheats can possess great strength, and red wheats can be very weak, and that a dark skinned wheat can yield a very white high grade flour. Quality of endosperm is one Mendelian unit, colour of skin is another. There is no inevitable correlation between them.

5) If on all other points they are of equal merit, wheats yielding a white flour are superior to those yielding a yellow or dark one.

6) A clear distinction should be drawn between wheats which appear to be hard, merely because the percentage of moisture they contain is low, and those which are really hard by nature, even when their moisture is raised to that of dry English wheat, say to 16 per cent.

7) Wheats, whether inherently hard or mellow, should always be of a "free milling" nature; in other words, it should be possible to obtain with the minimum of trouble and power the desired separation of husk from kernel. A mellow wheat which becomes "woolly" or a hard wheat which becomes "horny" when water is added before or during grinding, cannot be an ideal wheat.

8) The berry should be of average size, neither too short nor too long, neither too big nor too small.

9) Although bults should contain no stones, dirt, seeds or other extraneous matter, a low percentage of such impurities is not a great objection so long as their size and specific gravity differ substantially from those of wheat. Special care should be taken to exclude aromatic impurities, such as eucalyptus.

10) If the wheat come from a country where it is likely to suffer from the depredations of weevils, it should be of a kind which they do not readily attack, or it should be stored under conditions in which the risk of such damage can be minimised, or it should be exported soon after harvest.

11) If wheat come from a country where it is likely to suffer from an

excess of rain or humidity at harvest time, those varieties should not be grown which are likely to sprout easily.

12) Durum wheats are not likely to realize maximum prices in our markets for flour purposes. The objections against them are much less now than they used to be, but in spite of all improvements in our methods of milling them, they are not so suitable for flour making as wheats of the "ordinary" type. Some varieties of Durum are much superior to others, and if for agricultural reasons it is desirable to grow this type of wheat, many varieties of it should be tested by growers, and those selected for extensive cultivation which suit the producer and are least objectionable to the miller.

13) Wheats which require different methods of cleaning and conditioning as part of the milling process, should neither be grown together nor mixed together before that stage of preparation has been passed. If that recommendation be not observed, the miller cannot develop or utilize to the utmost advantage the potentialities of the wheats so mixed, and cannot be expected to pay maximum prices for them. Therefore, an inherently hard wheat should not be mixed for sale with a naturally mellow one, if the best commercial returns are to be obtained by the producer. For such reasons it is important to discover in very hot countries, to what extent irregularities in the texture of wheat are due to irregularities in water supply, and how by a proper regulation of water in irrigation, or by a proper preparation of soil the supply of moisture to the wheat plant can be made available at the right times. Furthermore, as white bran is not infrequently worth more than red, it is undesirable to grow together or mix before shipment white and red wheats.

14) Nondescript wheats are not of high value. If a wheat be really strong and poor in other respects, or if it yield flour of particularly good colour or flavour and on other points be of poor quality, its one great merit recommends it to buyers, whereas wheats of no outstanding merit on any point are merely "padding" and have no particular value. They can be sold, but at a low price.

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SECOND PART.  
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE  
AND ADMINI-  
STRATIVE  
MEASURES

898 - Regulations governing the Preparation, Sale, Barter, Exchange, Shipment and Importation of Viruses, Serums, Toxins, and Analogous Products intended for Use in the Treatment of Domestic Animals. - *United States Department of Agriculture, Bureau of Animal Industry*. B. A. I Order 196.

Under authority of the Act of Congress approved March 4, 1913, entitled: An Act making appropriations for the Department of Agriculture for the fiscal year ending June thirtieth, 1904 (37 stat., 832), the following regulations have been made; they are designated as B. A. I. Order 196, and have become effective on July 1, 1913.

No person, firm or corporation shall prepare, sell, barter or exchange, ship or deliver in the district of Columbia or in any territory of the United States or in any place under the jurisdiction of the United States, any virus, serum, toxin or analogous product (antitoxins, vaccines, tuberculins, malleins, microorganisms, killed microorganisms and products of microorganisms) manufactured within the United States unless it shall have been prepared at an establishment holding an unsuspended and unrevoked licence issued by the Secretary of Agriculture,

A licence will be issued only after an inspection of the establishment by a duly authorised officer or employee of the Bureau of Animal Industry, has shown that the condition and equipment of the establishment and the methods of preparation are in conformity with these regulations. Each licence shall terminate at the end of the calendar year during which it is issued, and it shall be reissued only after a new inspection. A licence will be suspended or revoked if it appears that the construction or the management of the establishment is defective, if the methods of preparation are faulty; if the products are advertised or labelled so as to mislead or deceive the purchaser in any particular; if the licence is used to facilitate the preparation, sale etc. of any worthless or harmful product; or if the licence violates or fails to comply with any provision of the of Act

of March 4, 1913 or of the regulations made thereunder. The preparation of any virus, serum, toxin or analogous product will not be allowed if put into trade in such a way as to mislead or deceive any one as to their nature. Every separate container of the above substances shall bear the true name of the product and the licence number assigned by the department, as well as a serial number affixed by the licensee for the identification of the product, with the records of its preparation. Each container shall also bear the "return date".

The importation of the above products will be allowed only to those persons who have obtained a permit from the Bureau of Animal Industry. Each importer of virus, toxin or analogous product shall make application in writing to the Secretary of Agriculture for a permit, such application shall be accompanied by the affidavit of the actual manufacturer produced before an American consular officer stating that the product mentioned is not worthless, contaminated, dangerous or harmful, and if it is derived from animals, that such animals have not been exposed to any infectious or contagious disease, except as may be essential in the preparation of the product and as specified in the affidavit.

Each application for a permit shall be accompanied by the written consent of the actual manufacturer that properly accredited officers and agents of the Department of Agriculture shall have the privilege of inspecting without previous notification all parts of the establishment at which such products are prepared.

Each permit shall terminate at the end of the calendar year during which it is issued.

The persons duly authorized by the Department of Agriculture to inspect establishments in which viruses and such products are prepared, shall be permitted to inspect the entire premises and all the equipment, such as chemicals, instruments, apparatus, etc., as well as the methods used in the preparation, handling and distribution of the said products.

No machinery, molds, instruments, tables or other apparatus which come in contact with virulent or attenuated microorganisms or toxins shall be used in the preparation of other forms of biological products.

All equipment, containers, machinery used in the preparation of viruses etc. shall be thoroughly sterilized before use.

Each licensed establishment shall keep permanent detailed records of the methods of preparation, of the sources of bacterial cultures, of the virulence of such cultures, of the methods of testing purity and potency of each product, together with the methods of preservation.

The stables used for experiment animals shall be in good sanitary conditions. Animals infected with, or exposed to disease shall be properly segregated, and all instruments, containers and other apparatus shall be thoroughly cleaned and sterilized before use. Establishments shall be so located as to avoid the spread of disease, and suitable arrangements shall be made for the disposal of all refuse.

Viruses, toxins and analogous products shall be stored in cold chambers or refrigerators both by the manufacturers and by the dealers.

The immunity unit for measuring the strength of tetanus antitoxin shall be 10 times the least quantity of antitetanic serum necessary to save the life of a 350 gram guinea pig for 96 hours against the official test dose furnished by the Hygienic Laboratory of the United States Public Health Service.

The number of immunity units recommended for the prevention of tetanus in a horse shall be at least 500 units.

899 - Decrees Establishing Experimental Stations for the Investigation of *Manihot* and *Hancornia speciosa* in the States of Bahia, Piauhv and Minas Geraes, Brazil. — *Diario Oficial, Estados Unidos do Brazil*, Year 1,11, No 56, pp. 3553-3565. Rio de Janeiro, March 9 1913

By the decrees Nos. 10053, 10054 and 10055 of February 14, 1913, experimental stations are to be established in the states of Bahia, Piauhv and Minas Geraes respectively for the culture of *Manihot* and *Hancornia speciosa*. The purpose of the stations is the experimental investigation of all the factors related to the culture of the principal species of *Manihot* (*Glaxiovii*, *dichotoma*, *heptaphylla*, *Piauhvensis*) and of the principal varieties of *Hancornia speciosa*, in order to determine which are best adapted to certain soils and to provide information and complete data to agriculturists and others interested in the subject as to the necessary methods and processes to be adopted for the production of rubber in those regions on the most up-to-date and economical lines. Further, investigations will also be undertaken with regard to food plants and stock breeding which might prove useful adjuncts to the plantations.

900 - Grants for the Development of Agricultural Education in the Argentine. — *Boletín oficial de la República Argentina*, Year, XXI, No. 5789, pp. 911-912. Buenos-Aires, April 21, 1912.

The presidential decrees of March 28th, 29th, and 31st, 1913, have authorized the following expenditure:

For the founding and carrying on of the « Escuela de Agricultura de 25 Mayo » . . . . .	£ 2 473
For the founding and carrying on of the « Escuela de Mecanica agricola » at Bahia Blanca . . . . .	1 595
For the founding and carrying on of the « Escuela de Agricultura » of the Tigre . . . . .	4 963
For building and working a model workshop at the Tucuman school . . . . .	1 637
For purchase of laboratory material for the above schools . . . . .	3 019
For erecting buildings for agricultural schools . . . . .	48 862

901 - Agriculture in Russia, — HITLER, M. H. in *Société Centrale d'Agriculture du Département de la Seine-Inférieure*, Year 153, New Series, No. 21, pp. 62-93. Rouen, 1913.

European Russia forms an extensive plain, which at no point from the Black Sea to the White Sea or from the Carpathians to the Urals, attains a height of 300 m. (1000 ft.) above sea-level. Its climate is markedly continental and is characterized by great differences of temperature in winter and summer, a rapid transition from the hot to the cold season and *vice versa*.

The vegetative period is unusually short, so that, in spring especially, the time and labour available for preparing the fields are scarcely sufficient. The annual rainfall (St. Petersburg 504 mm. 19.8 ins), Moscow and Riga 541 mm. 21.3 ins), Warsaw 561 mm. (22.1 ins.) is adequate on the whole, but is very irregularly distributed among the different periods of the year. The present scarcity of food in Russia is due, not to absolute want of rain, but to its deficiency at the times when the crops are just coming up, namely August and September for winter crops and April and May for summer crops.

With regard to the various types of soil and their cultivation, four different regions can be distinguished in Russia passing from north to south: the tundras, the forest region, the black soil region and the dry steppe.

In the tundra zone, which occupies the northern halves of the Government of Archangel and of Finland, lichens and mosses predominate and only in sheltered spots are occasional willows, spruces and dwarf birches to be found.

In the forest region extending southwards to the middle of the Governments of Kazan, Nizhnii Novgorod, Ryazan, Tula, Orel, Kiev and Podolia, the winter lasts for 8 or 9 months. In this zone, which was formerly completely wooded, the burning-off system is practised in many places. This method of cultivation is, however, gradually disappearing, and particularly in the south of this region is being increasingly replaced by the three field system, and even by a six or eight year rotation with seed-leys (clover and timothy). Here with the exception of the sugar-beet district, agriculture, cattle-breeding and agricultural industries are the furthest advanced. In addition to large quantities of farmyard manure, chemical manures are increasingly used. Flax is the chief crop grown.

Bordering the forest region throughout its whole southern extent is the black soil region which occupies between 250 000 and 280 000 sq. miles. The cold and warm seasons of the year are here of about equal length. The three-field system is exclusively practised. The rich soil is never manured, at all events on peasant properties, and in many districts, especially in the south, cereals are grown year after year. While only 40 per cent. of the forest region is arable land, the latter occupies 70 or 80 per cent. of the black soil area, owing to the extensive cereal cultivation.

In the south, this productive zone passes gradually into the dry steppe region, and into the zone of the nomads and herdsmen, which further on borders the salt steppes of the Caspian Sea.

After the freeing of the serfs in Russia in 1861 the curious form of collective ownership obtaining in the peasant communities (Mir) hindered agricultural progress. Since 1906 the Agrarian Commission has been engaged in converting the collective property of the communes into the private property of the peasants (1).

(1) For the reorganisation of agricultural land tenure in Russia, see No. 736, B. June 1913. (Ed.).

The total area of European Russia (exclusive of Poland and the areas occupied by lakes and rivers) is 1 944 726 sq. miles which in 1910 were divided as follows :

	acres
Forest . . . . .	408 584 576
Cultivated Land . . . . .	197 545 319
Wheat . . . . .	61 210 990
Barley . . . . .	26 451 477
Oats . . . . .	39 053 007
Rye . . . . .	63 416 065
Maize . . . . .	3 638 348
Millet . . . . .	7 496 683
Potatoes . . . . .	8 243 382
Buckwheat . . . . .	1 933 391
Flax . . . . .	3 566 642
Hemp . . . . .	1 801 893
Natural meadows and pastures .	66 327 847

Hitherto, rye has taken the first place among the cereals. For the last ten years, however, its cultivation has not extended, but has rather shown a tendency to decrease. In 1910, 674 508 tons were exported, valued at £ 3 200 000.

The area under wheat increased from 47 000 000 acres in 1901 to 62 000 000 acres in 1911. Russia is now the chief wheat-exporting country in the world; her exports were 5 126 764 tons in 1909 and 6 178 767 tons in 1910, while in 1910, the United States exported 2 760 000 tons, Argentina 1 970 000 tons, Canada 1 400 000 tons, British India 1 200 000 tons and Rumania 1 900 000 tons.

The area under barley has steadily increased during the last 10 years : in 1910 about 4 000 000 tons were exported.

The total exports of wheat, rye, barley and oats in 1910 amounted to 129 824 000 tons with a value of £ 70 099 016.

Russia is without doubt the chief flax producing country. The areas and yields for this crop were :

	Area in acres			Total yield in tons 1911	Yield cwts. p. acre
	1912	1911			
In European Russia	3 467 295	3 428 694	{	Seed 513 592	3.1
				Fibre 461 424	2.8
Asiatic Russia	227 770	279 544	{	Seed 22 168	1.6
				Fibre 21 700	1.6

The amount of flax exported shows a tendency to decrease and this is due partly to the increased demand for the raw product in the home factories and partly to the fact that sugar beet is taking the place of flax. In 1910, Russia possessed 1 648 216 acres of sugar beet fields and these had increased to 1 944 746 acres in 1911, while its sugar production amounted last year to 1 993 990 tons. On many estates from 8 to 8.7 tons of beets

are produced per acre, but the crops, especially on the peasant properties could be greatly increased by the more liberal use of chemical fertilizers.

On July 1, 1912 the numbers of live stock in European Russia were as follows :

Horses . . . . .	23 860 178
Cattle . . . . .	34 547 348
Sheep and goats . . . . .	42 735 567
Pigs . . . . .	11 941 568

The number of animals exported from Russia is relatively inconside-  
rable, but the export of animal products is assuming ever-increasing impor-  
tance. In 1898, 10 120 tons of butter worth £688 064 were exported while  
in 1907, 56 758 tons were exported, valued at £4 933 400. Most of the export-  
ed butter goes to Great Britain, Germany and Denmark. Russia exports  
annually poultry (especially live and dead geese) to the value of about  
£1 680 000 and in 1910, nearly three thousand millions of eggs, worth  
£6 680 800 were exported.

In spite of the great progress which agriculture has already made in  
Russia, and which is not manifested so much by increased crops per unit  
area, as by the extension of the cultivated area, it has not yet reached the li-  
mits of the natural resources of the country. But the gradual adoption of bet-  
ter and more intensive methods of cultivation, the growing use of chemical  
fertilizers, the development of the home agricultural machine industry  
together with increased imports of foreign implements and especially the  
all important reorganisation of agricultural land tenure, indicate that the  
production per unit area will shortly be raised.

902 - *The Agricultural District of Groningen, Holland.* -- VERRIJN STUART, C. A.  
in *Landwirtschaftliche Jahrbücher*, Vol. 43, Part 3, pp. 519-528. Berlin, May 3, 1913.

A review of the historical development of agriculture (cereal and  
sugar-beet cultivation), of moor cultivation (peat-cutting and potato-  
growing), and of the industries connected with agriculture (the manufacture  
of potato meal and cardboard made from straw) in the Groningen district.

903 - *The Eradication of Mosquitoes by the Cultivation of Bais.* - *Communication*  
*to the International Institute of Agriculture* by DR. CHAS. A. R. CAMPBELL, San Antonio,  
Texas.

RURAL  
HYGIENE

The writer begins by a brief review of the discoveries made concerning  
the plasmodia of malarial fever, he then describes how the mosquitoes  
inoculate their living poison into its human host, and communicates  
the results of an enquiry made by him by means of hundreds of letters  
addressed to health officers and druggists in different parts of the Union,  
in order to ascertain the existence of malaria in the several States.  
He quotes Dr. L. O. Howard, Chief Entomologist of the United States De-  
partment of Agriculture who very conservatively estimates the tribute  
that that Nation pays to malaria at one hundred million dollars yearly.

The greatest enemy of the mosquito, according to the writer, is the  
bat. For the cultivation and propagation of this animal the writer has  
devised a kind of wooden tower or roost (see fig. 2) which offers the ad-

vantage of preventing bats, who are obliged usually to fly long distances from their caves in search of food, remaining continuously on the wing for ten and twelve hours at a time, from continually seeking new quarters.

Besides the well known means of defence which the bat possesses against its enemies *viz* its nocturnal habits, its propensity for hiding in dark places during the day, its facility of compressing its body into small apertures, there is the character of the hair covering its body. This last feature is considered by the writer to be a protection against the stings of the *Anopheles* which during the day also inhabit the same dark places. This protection appears to be due to the peculiar formation of the hair, which is not a round and smooth shaft, but is similar in form to a number of Morning-glory flowers strung on a straw, with the edges of the flowers, terminating in points with the bells outward. Possibly the odour of the bat also serves to protect it from mosquitoes. That bats are most remarkably free from disease is evidenced by the fact that they live in caves by the million, hang touching one another, and even to one another in huge bunches, yet people engaged in the business of gathering guano from caves very rarely find a dead bat.

That mosquitoes form the chief diet of bats is certain, ninety per cent being a conservative estimate. The character and arrangement of its teeth clearly show it to be carnivorous. It will eat pieces out of hams and bacon left in smoke houses. The character of the bites show the pieces to have been torn out, instead of being gnawed, as would be the case, if gnawed by some rodent. The mosquito being a blood-sucking insect, furnishes the bat with an ideal carnivorous diet.

Knowing of a hunter's small cabin some ten miles from San Antonio, where bats were congregating, I procured two large white sheets and spread them on the floor of the cabin about four o'clock in the morning, and awaited their coming. I had however stuffed the roosting places in the hut with rags so they could not roost out of range of the area of the sheets. I watched carefully and counted the proper number going in, and verified the count from the inside of the cabin. I then left them and returned in the evening to count them again when they flew out; after counting the same number going out as came in, I very carefully collected the pieces of guano on the sheets, put them in a little box, and again spread out the sheets to continue the experiment the next day. This was done three times consecutively, and the result is that it averages twenty-six (26) pieces of guano to each bat. These observations were made in the month of November, purposely selected on account of the food of the bats being about at a minimum at this time.

Having ascertained approximately how many times a day a bat dropped guano I took one dropping or single piece of guano and macerated it in peroxide of hydrogen for several days. The peroxide dissolves the oxidized and concreted mucus which holds the mass of guano together. I then filtered this through ordinary filter paper the weight of which I had previously ascertained, and found the residuum to contain principally the comminuted skeletons of mosquitoes; the proboscis, the heads, eyes,





Fig 1 — Bat Guano, Showing Skeletal Remains  
of Insects, principally Mosquitoes

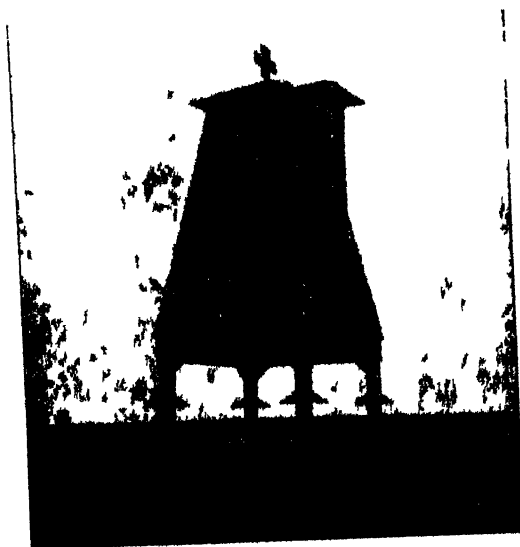


Fig 2 — Dr Campbell's Hygrostatic Guano - Producing  
Bat Roost

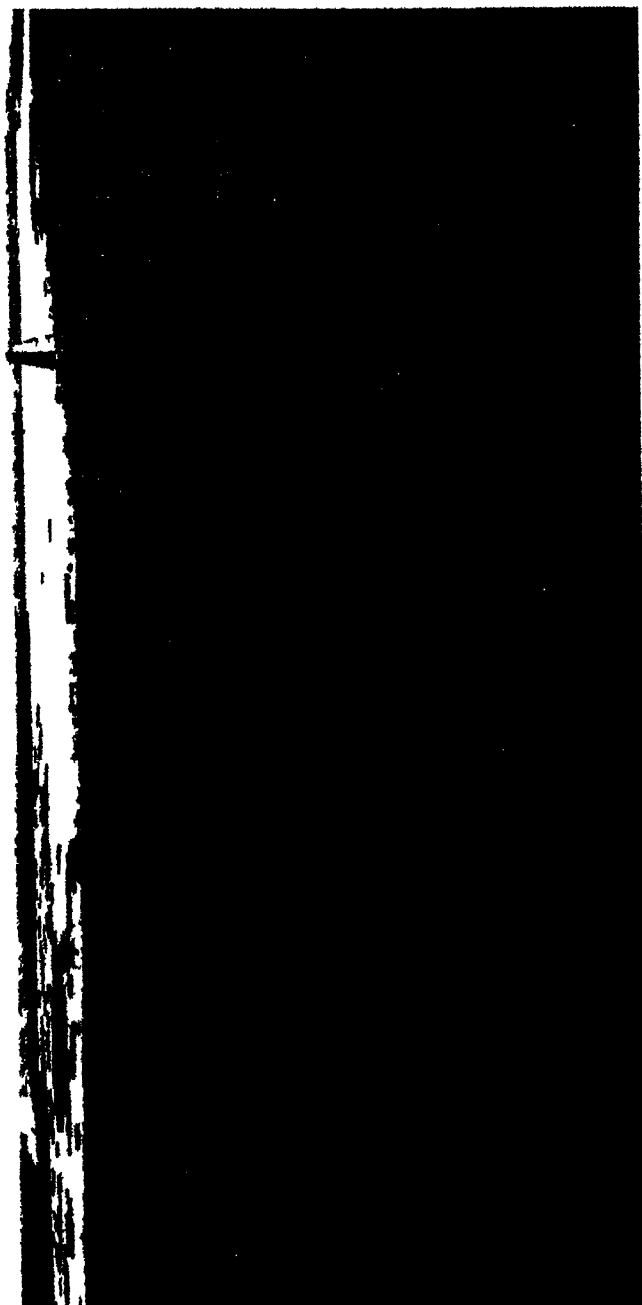


Fig. 3. --- Model Bat Roost Showing Large Extent of Standing Polluted Water



thoraces, abdomens, legs, wings and scales of mosquitoes (See fig. 1). The external body or shell of mosquitoes being of a horny substance known as chitin, affords the bat no nutrition being entirely insoluble, hence passes through the alimentary canal as fecal debris. The contents of the head and in fact all internal organs are digested. The weight of this filtered residue of one bat dropping, was approximately  $1\frac{1}{25}$  of a grain (1).

This much of the work is purely scientific, but it demonstrates the enormous value of these usually despised creatures. I was content with having done this much, and would have considered the work concluded, had it not occurred to me, to weigh the twenty-six pieces of guano.

Twenty-six pieces of guano toward the end of the season, when insect life is at a minimum, weigh two and three-fifths grains; the bat in this climate is active from about Feb. 16 to as late as Dec. 15, depending on the season.

In order to be very conservative in estimating the value of the guano, we will calculate only on eight months, namely from the middle of March to the middle of December.

*Commercial value of one bat roost at estimated capacity of 500,000 bats.* — Twenty-six pieces of guano, which are the droppings of one bat per day, weigh two and three fifths ( $2\frac{3}{5}$ ) grains, which equals seventy eight (78) grains per month, or, six hundred and twenty-four (624) grains per bat in eight months. 500 000 bats drop in the same time 624 times  $500\,000 = 312\,000\,000$  grains, or more than 20  $1\frac{1}{4}$  tons; at 30.00 dollars per ton, equals \$607.50. A structure large enough to hold 500 000 bats would cost, figuring long, about \$1200; now let us treat this estimate just as we did the hygienic, deduct 50 %; I think we could well afford to deduct 50 % again from that, and still leave a nice margin of income, on the investment.

In the beginning of this writing, it suggested that the bat ought to be provided with a home, in order that we might take advantage of its wonderful habits, and the photograph shown and marked "Dr. Campbell's Hygiostatic Guano-Producing Bat Roost" represents such a structure in actual existence — though intended only as a working model for demonstration. It has proved itself more than a model. The Roost stands ten feet above the ground, and the structure itself, twenty-feet above that, is twelve feet at the base, and six at the apex. It is given that steeple shape, and placed above ground for several reasons: Its shape makes it resistant to high winds and the elevation from the ground acts as a wind break, and allows the supporting posts to be fitted with contrivances to prevent the bat's enemies, from gaining access to the Roost, also a wagon

(1) Basing his calculations on the analyses of one hundred dried mosquitoes, the writer comes to the conclusion that each of the droppings of a bat contains the skeletal remains of ten mosquitoes, and as a bat drops upwards of 50 pieces of guano a day he considers the number of mosquitoes destroyed by each bat to be above 500 per item. He further assumes that there are at least five hundred thousand bats per roost.

to be driven underneath at the base, which is provided with a hopper on hinges and which opens downward, enabling the guano to be easily collected.

The defense which this structure affords the bat from its natural enemies is of great importance. These enemies are coons (*Procyon lotor*) opossums, wild-cats, skunks, civet-cats (*Viverra civetta*) and chicken snakes (*Coleuber quadrivittatus*). It is during the breeding season, that the bat suffers most from its natural enemies. Shortly after the young are born, they cling mechanically to the mother's body, and very often loosen their hold, and fall to the bottom of the cave, only to become a prey to some of the aforementioned wild animals, who seek bat caves at this particular season. The mother bat darts down after her young and she also falls a victim to that most noble of characteristics, maternal instinct. These features of protection, and freedom from molestation, will cause the bats to increase so rapidly, that the capacity of the Roost will be soon taxed, especially if it be erected in some quiet place, some distance from human habitations.

This bat Roost I erected at the head of a large body of standing water, ten miles south of the city of San Antonio. The inner construction (which is of course the most vital) is based on lines, after long and most careful study, entirely in harmony with their most singular habits. The louvered window seen on the outside, forms the entrance and exit for the bats. A red cross on the apex of the roof, designates it as a hygienic measure. In choosing the location for the erection of this Roost, it might be well to mention that it was selected because conditions and environments in the vicinity of its location could not be more ideal for the breeding of mosquitoes. Into this large body of water, known as Mitchell's Lake, flows the sewage of San Antonio, averging 10,000,000 gallons per day, the extent of territory covered by this lake, is estimated by its owners at 900 acres. It never overflows, as the water is used for irrigation, some by gravity, and some by pumping. The huge amount of organic matter in the water, the large pools formed both by irrigation on the land, and water left in the laterals. the receding water in the lake left when used largely, the large pools formed by seepage through earthen dams, outside of the main body of the lake, are the existing conditions, and I am sure that no more exacting demands could be put to the value of bats as destroyers of mosquitoes, than such environments. No swamp in the low lands is worse.

The Roost was finished on April 2, 1911. Before locking the louver, I sprayed the inside with a chemical fluid giving off an odor identical to the natural odor of the bat, and spread twenty-five pounds of *fresh* guano, in the hopper at the bottom of the Roost.

On Aug. 4, 1911, or about four months later, it became tenanted by a colony of bats attracted there by the odor, that I estimated at several hundred, from the fact that it took them flying in one constant stream, fully twenty minutes. The next year, 1912, the Roost became so thickly stocked, that it took them several hours to come out; they came out in clouds. This feature conclusively demonstrates the fact, that bats can be

colonized. There are other features employed in the colonization of these creatures, and these require time and labor, but one is amply rewarded in the end.

When these little "bird animals" once become accustomed to a place, they never leave it except at night to feed and always return in the morning. During the spring of 1910 and 1911, in studying the period of gestation in bats, I had occasion to catch a great many from an old building and as I could only use the females, I marked every male bat by cutting a tiny "v," on the right ear, and liberating them from my work room, some three miles from the old building. In a week's time, when I again caught a large number from the same place; I would invariably catch some of the same ones again; and in many instances, for the third time, evidenced by the different markings.

It might be said that this vicinity is better favored for the cultivation of bats than others. The answer is very simple. Of course there are more bats in the neighborhood of hills and mountains, than in low lands and swamps because caves are their normal homes, and these are found in hilly and mountainous regions, but the fact remains, that they can be colonized, and on just such a territory as desired. There are bats in every city, town or village in the world, because the geographical range of that creature, whether of one species or another, like its principal food, extends from Alaska to Patagonia on this hemisphere, and the same holds good on the other half of the world. The Roosts must be built, as said before, entirely in harmony with their habits, or it will prove a failure, as I know from actual experience in building the first Roost.

*The Practical Hygienic and Commercial Results.* — A few days ago I made a personal canvas to every family living on the east side of the Lake. I spoke to the heads of 14 families, and each one declared to me, that the mosquitoes last year were very much less, than the year before. They also declared that chills had almost vanished. To a man they had become friends of the bat, and they instructed their children never to kill one.

One of the more prosperous tenants, pointed out to me a sleek looking herd of work animals as the best evidence of the scarcity of mosquitoes; he said that during 1910 and 1911 his stock was very thin notwithstanding being well fed, and he was certain the emaciation was due to anemia caused by depletion on the part of the mosquitoes. Several others said that in the same years they were at times driven from the work of irrigating at night, by the myriads of mosquitoes on the lake. Last year 1912, they scarcely bothered them.

One of the tenants said he had often awakened at night, and found what he thought were hundreds of bats flying about in his cottage, all doors being open on account of the heat; knowing them to be in quest of mosquitoes, he never molested them, neither did the mosquitoes molest him, after the bats left. A prominent San Antonio business man who frequently goes duck-hunting on this lake was very much surprised last

year, when he found he was not molested by mosquitoes when remaining in the blinds rather late towards evening, in quest of game,

As it becomes essentially necessary that these creatures be not disturbed for some time after finding a new home, I did not go very near the Roost, nor allow any one within the enclosed acre. On Dec. 18, 1912 after a cold snap, I opened the Roost for the first time, and found between four and five hundred pounds of guano had accumulated in the hopper. A sample shows the following chemical analysis:

Moisture . . . . .	10.70 per cent
Water soluble phosphoric acid . . . . .	1.70 "
Citrate soluble phosphoric acid . . . . .	0.35 "
Citrate insoluble phosphoric acid . . . . .	0.10 "
Total phosphoric acid . . . . .	1.45 "
Available phosphoric acid . . . . .	1.35 "
Nitrogen . . . . .	11.76 "
Ammonia . . . . .	14.26 "
Potash . . . . .	0.98 "

As to bats and guano as a commercial proposition, I quote a letter from Mr. Robert P. Marbach, Bracken, Texas, who deals in guano:

I work two bat caves, one 19 miles from Sabinal on the South Pacific Rail-road, the other, seven miles from here (Bracken). They are known as the Frio cave and the Cibolo cave. The Frio cave is very large and yields about 60 tons annually, but I loose about 20 tons on account of its enormous size and colossal boulders, which prevent gathering all of the deposit. The Cibolo cave yields on an average seventy-five tons annually; it is much smaller than the Frio cave, but the bats are not so scattered, and I have a smaller area to work. I have however the same trouble in this cave that I do in the other, viz. large rocks which prevent me from gathering the entire deposit. I calculate that I loose in this cave, about one car-load. However in a wet year, when all water-holes are full, and there is plenty of water, I count on a heavy car-load more from each cave.

"This business was handed down to me by my father, who controlled it for many years. I am supplying his customers, and ship large quantities to Crystal Springs, Jackson and Hazelhurst Miss., though the entire crop of my Cibolo cave I shipped to Laredo, Texas on account of an extensive onion industry which has developed there. I get thirty dollars a ton for my product, put in sacks of about 100 pounds ,,"

In conclusion and as resumé of this work, let me again revert to a few facts:

1. — That the mosquito is unquestionably one of man's most formidable enemies, not only "per se" but also by the subtle role he plays in transmitting disease-producing bacteria.

2. — That the mosquito may be considered as a good food for the bat.

3. — That we can build a home for the bat where it will be protected from his enemies, and propagate in countless numbers, at the same time protecting us, by improving our hygienic conditions.

4. — That the commercial feature in the propagation of bats will insure its adoption, the hygienic benefits that follow will protect the community in which they are erected, especially the poorer classes who know nothing of the dangers of mosquitoes or the use of screens, and amongst whom we find the most sickly.

5. — That when we propagate this most useful creature, he not only destroys the disease-producing mosquito that serves it as food, but it actually converts that most malevolent of insects into a high grade fertilizer.

924 — The Work of the "Landes-Kulturrat" of Lower Austria in the Promotion of Dairy Farming. — SARATINI, P. in *Landes Anzeiger des Erziehungswesens Oesterreich u. d. Enns*, Year 9, No. 11, pp. 21-28, Vienna, June 1, 1913.

During the last three years, the "Landes-kulturrat" of Lower Austria has held a series of courses for the promotion of dairy farming, and has also given assistance in the purchase of dairy machines and apparatus, as well as making grants to different associations. The courses are divided according to the subjects dealt with, into classes for "coolers" managers and milkers.

The "coolers" are the men employed by milk-supply associations in the collection, examination, cooling and dispatch of milk; in their course, instruction is given in the principles of the dairy industry, special stress being laid upon the practical handling of the milk and upon milk control on a scientific basis. The courses are always held in the same place, where the necessary rooms, machines and cow-sheds are at the disposal of the students. This course lasts for 12 days; at the end a theoretical and practical examination is held. From November 1910 till April 1913, 11 coolers' classes were held and they were attended by 114 persons. The whole cost of these courses (without teaching material) amounted to £348; this was defrayed by the "Landes-kulturrat."

The object of the managers' course is to instruct the managers of the associations in superintending the work of their subordinates and teach them how to deal with possible suggestions and justified observations. The subjects of instruction are otherwise the same as those of the coolers' course. So far five of these course have been held, attended by 47 persons. The total expenses were just over £59.

The object of the milkers course is to give, especially to the sons of farmers, an opportunity of learning the theory and technique of systematic milking. The course, however, is not confined to this subject, but also includes the whole field of systematic dairy-cow keeping and treatment. The course lasts one month. Besides the specialist and the dairy instructor, who give the classes for coolers and managers, some of the milkers' classes are also taken by a vet. The course terminates with a theoretical and practical examination, but after some months, during which the students have to practise what they have learnt, a second and entirely practical exami-

EDUCATION  
AND EXPERI-  
MENTATION IN  
AGRICULTURE  
AND FORESTRY

nation is held; it is on the results of this that the diploma is granted to the successful candidates. So far, the "Landes-kulturrat" has held five of these milkers' courses, which were attended by 47 persons. The total expenses amounted to nearly £452.

- 905 - **The Live Stock Institute at Louvain in Belgium.** - FRATEUR, J. L. Note sur l'Institut de Zootechnie de Louvain. *Ministère de l'Agriculture et des Travaux publics, Office rural, Rapports et Communications*, No. 3, pp. 81-85. Brussels, 1913.

The Live Stock Institute at Louvain was founded in 1908 for the purpose of the scientific study of all the problems connected with animal breeding. It also affords opportunities to students of the Agricultural section of the University to further prosecute their studies in this direction. The writer describes the building and its arrangements and also gives an account of some of the experiments which have already been made, or are in progress. In order to test, in a practical manner, the results of these experiments, the Institute is in connection with the agents managing the estates of charitable institutions, and with well-known breeders.

Attached to the Institute is an information bureau, which in 1912 sent out over 80 letters giving advice.

- 906 - **New Regulations regarding the Admission of Regular Students to the Milan Agricultural College.** - *Gazzetta Ufficiale del Regno d'Italia*, Year 1913, No. 102, p. 2545. Rome, May 2, 1913.

A royal decree of April 6, 1913, states that any person wishing to enter the Milan Agricultural College as a regular student must, in future, possess a certificate showing that he has passed the final examinations at a "Liceo" or "Istituto tecnico" (1) or else have a leaving-certificate of the higher course at the Schools for Wine-Making.

- 907 - **Agricultural Shows.**

#### *Algeria*

1913. September 5-7 - Batna. Live Stock Show (Cattle, Sheep, Horses) organized by the Agricultural Society (conice) of the town.

#### *Australia: New South Wales*

1914. January 14-15. - Show of the "Albion Park A., H. and I. Association" M. A. Brown, Secretary.

January 23-26. - Show of the "Klamu A. Association" G. A. Somerville, Secretary.

March 3-5. - Show of the "Urulla A. Association" H. W. Vincent, Secretary.

April 1-3. - Show of the "Upper Hunter P. and A. Association". Muswellbrook. R. C. Sawkins, Secretary.

April 7-15. - Sydney. Show of the "Royal Agricultural Society". H. M. Somer, Secretary.

#### *Australia: Victoria*

1913. September 22-27. - Melbourne Show of the "Royal Agricultural Society of Victoria".

(1) These about correspond to the matriculation examination of London University; the "Liceo" is the highest school with classical education, and the "Istituto tecnico" the corresponding stage in technical education, (Ed.).

*Austria*

1913. August 9-12. — Komotau. Agricultural Show and Twelfth General Meeting of the Beekeepers of German Bohemia.

*Belgium*

1913. August 9-18. — Ghent. Flower and Horticultural Show organized by the van Houtte Club. September 6-9. Louvain. International Poultry Show, organized by the Poultry Association of the District of Louvain, under the patronage of the National Federation, of the Municipality and of the Agricultural Comice. For information apply to 21 Rue des Pénitentes, Louvain.

September 16. — Sibret — Show of potato-lifting machines.

September 23-27. — De Chassart Estate. Show of mechanical tractors and tilling machines, organized by the Ministry of the Belgian Colonies, with the object of generalizing the use of mechanical tillage in the Belgian Congo. £ 3600 will be given in prizes. The best machines will be bought for the Belgian Congo Colony or will be awarded an indemnity to defray part of the expenses incurred by the exhibitor in taking part in the trials. Entries close on September 1. For information address: Directeur Général de l'Agriculture au Ministère des Colonies, 7 Rue Thérésienne, Brussels.

December 14-15. — Mont-sur-Marchienne. National Poultry Show, organized by the Poultry and Rabbit Club of the Town. Address: Léopold Germain, place du Vez, Mont-sur-Marchienne.

1914. February 7-9. — Iseghem. Fourth International Poultry Show organized by the Hoenderboudt Neerhof. V. Laridon, Secretary, Café Royal, Iseghem.

*Canada*

1913. September 15-20. — Fredericton, New-Brunswick. Agricultural and Industrial biennial Show and Fair open to the whole Dominion of Canada and to the State of Maine for Live Stock, Poultry and Agriculture in General; The Industrial Section is open to all. Total of Prizes for Live stock and Agricultural Show. £ 3108; Medals and Diplomas for the Industrial Show. For information apply to W. S. Hooper, Secretary, Box 150, Fredericton, New Brunswick, Canada.

*France.*

1913. August 9-10. — Perpignan (Pyrénées orientales). Catalan Horticultural Fêtes for the Thirtieth Anniversary of the Roussillon Horticultural Syndicate. Horticultural Fêtes. Garden Competition, General Exhibition of Horticultural Material and Production. Trials of Processes, Material and Machines used in Horticulture. Poultry and Bee Show. Address: Seat of Horticultural Syndicate, Café Garud, Avenue de la Pépinière, Perpignan.

Saint-Julien (Haute Savoie). — Competition for the Construction of Cheese Dairies. — The Agricultural Comice of the District of Saint-Julien-en-Genevois (Haute-Savoie) organizes a competition for the construction of cheese dairies with pigsties attached, the competition is open to all who take an interest in the subject. The plans must be sent in before September 1, 1913 to l'Ingénieur des améliorations agricoles, 46 Boulevard des Brotteaux, Lyons. The prizes will be awarded at the same time that the Show of the District Agricultural Comice of Saint-Julien-en-Genevois will be held at Annemasse, namely September 7, 1913. For information apply to M. Maitrol, Ingénieur des Améliorations Agricoles, 46 Boulevard des Brotteaux, Lyons. or to M. Guilhermet, Professor of agriculture at Saint-Julien-en-Genevois.

September 5-6. — Rive de-Gier (Loire), Show organized by the Agricultural Society of the Department de la Loire. Entries up to August 25. Apply to J. Biron, Secretary-general of the Society, 27 Rue Saint Jean, Saint Etienne.

September 5-7. — Castres, Tarn. Departmental Show of Stock breeding, Agriculture, Vine-growing, Horticulture and Packing Material, and Test of Agricultural Ma-

chinery and implements organized by the Agricultural Comices of Albi, Brassac, Castres, Gailhac, Lavaur, Mazamet.

September 13-14. — Montbéliard, Agricultural Show organized by the Agricultural Society of Doubs.

September 22-28. — Auray. Show of Brittany Draught Horses and Nags for the Artillery, of Spotted Black Brittany Cattle, Brittany Pigs, Poultry, Bees and Horticulture etc., organized by the Morbihan Agricultural Society. For information: M. Petit, Directeur des Services agricoles à Vannes.

October 3-5. Laval. — Annual Mayenne Departmental Show.

November 6-10. Pau. — Exhibition of Horticulture and Viticulture, organized by the Agricultural and Viticultural Society of Pau. Address: M. Y. Pomès, Secretary of the Society at Pau (Basses-Pyrénées).

December, Douai. — National Poultry Show organized by the Club of Amateur Agriculturists and Breeders of the Douais district. Apply to M. E. Mathieu, Secretary general, at Roost-Warendin (Nord).

1914. March. Nice. — Great Agricultural and Horticultural Exhibition.

1916. Paris. — International Colonial Exhibition.

### *Germany.*

1913. September 4-5. Ulsen. — District Live Stock and Agricultural Exhibition.

September 6-7. Altena, Westphalia — International Rabbit Exhibition, organized by the "Rasse Kaninchenzüchter Verband" for Altena. For information apply to Herr Karl Storch, Rasse-K-Z-V. Altena.

September 6-8. Laufen Live Stock Show of the District.

September 6-11. Mayence. — Twentyseventh Congress of German Vine-growers, with attached Exhibition of Wines and Apparatus and Utensils used in Viticulture and in Wine-making, with Special Scientific Section (Control of Vine Pests; Protection of Birds, etc.) apply to President of Committee: Herr Gündert at Mayence, Stuthaus.

September 7-9. Neustadt (Duchy of Coburg) Exhibition of Animal Husbandry, Agricultural Produce, Machines etc.

September 12-14. Wesel. Agricultural Exhibition, organized by the Association for the Development of the Breeding of the Red Spotted and Black Spotted Races of the Lower Rhine (Zuchtverband I zur Hebung der Rindviehzucht (Niederrheinisches Rot- und Schwartz buntes Vieh), by the Horse-breeders of the Ree district (Pferde Zuchtverein des Kreises Rees), and by the local Section of the same Association.

September 20-20. Lenger (Westphalia). — Live Stock Agricultural Produce and Machines and Implement Show.

September 27-28. Morsbach (Rhine Province). — Agricultural Show.

November 1-4. Offenbach. — Sixth Hessian Poultry Show.

November 15-17. Bretzenheim (Mayence) Twelfth Young Poultry Show organized by the Hessian Rhenish Association (Rhein hessischer Verband).

November 29-30. Kiel. — Poultry Show.

1914. Spring. Berlin — Special Exhibition of the Leather Belting Industry organized by the Union of the German Leather Belting Manufacturers (Verband der Ledertreibriemen Fabrikanten Deutschlands E. V.) and held at the same time as the general yearly meeting of the Union.

1914. June 25-30. Hannover. — Exhibition of the German Agricultural Association (Deutsche Landwirtschaftsgesellschaft).

### *Hungary.*

1913. September 12-14 Budapest. — Second District Draught Horse Show.

*Italy.*

1913. Brusegana (Padua) Royal Practical School of Agriculture. — National Competition of Maize Hybrids, organized by the Padua Provincial Commission for the Control of Pollen. Amount of Prizes offered £ 120.  
 September. Motta di Livenza (Treviso) — Agricultural and Live Stock Show.  
 September. Milan, Villa Reale. — Exhibition of Table Grapes and of Non-alcoholic Grape Products in Connection with the Fourteenth International Antialcohol Congress.  
 September. October. Rovato (Province of Brescia). — Agricultural and Industrial Show. Address to the President of the Executive Committee, Sig. Verzaletti, Rovato.  
 Florence. Prize Competition for Plans of Rural Buildings, organized by the Agricultural Comice of Florence. Entries received up to October 30, 1913. Apply to the Seat of the Comice, 8 Piazza Signoria Florence.  
 1914. April 15-30. Rome. — Second Exhibition of Agricultural Novelties with Special Exhibitions of the Roman Campagna, of the Womens' Section, and of the Italian Colonies, organized by the Association of Italian Agriculturists. Apply to the Seat of the Association, 8 Via XX Settembre, Rome.

*Spain.*

1913. September, Bilbao. — Live Stock and Machine Show for the Provinces of Vascongadas, Navarre, Santander, Asturias, Burgos and Logroño, organized by the "Ayuntamiento" of the Town.

*Switzerland.*

1913. August 27-29 Ostermündigen. — Sixteenth Bull Show and Market, organized by the Swiss Federation of Breeding Syndicates of the Red Spotted Breed. For information apply to M. G. Luthy at Zollikofen (Berne).  
 1915. September. Geneva. — International Horticultural Show with Special Competitions organized by the Geneva Horticultural Society.

*Tunis.*

1914. April. Tunis — Motoculture Exhibition, organized by the general Direction of Agriculture, Commerce and Colonisation at the request of the Chamber of Agriculture du Nord.

*United Kingdom.*

1913. September 24-25 Kendal, Market Hall. Annual Exhibition of Honey, Wax and Beekeeping Appliances, organized by the Cumberland and Westmoreland Bee Keepers' Association, and held at the same time as the Congress of the Fruit Growers of the Northern Counties. Apply to G. W. Avery Wetherall, Carlisle, or to Geo. Clitham, Low Green, Staveley, Kendal.

*United States.*

1915. January 1. — December 31. San Diego, California. — International Exhibition of the Methods of Production.

908 — **Congresses.**

*Austria.*

1913. September 21-28. Vienna. — Eighty-fifth Meeting of German Naturalists and Medical Men. One section is devoted to Agricultural Chemistry and to Agricultural Experimentation.  
 1914. Vienna. — Twelfth International Assembly of the Chemists of the Leather Industry.

*Belgium.*

1913. September 8-9. Ghent. — Fifty-fourth Pomological Congress of France, under the patronage of the Royal Society of Agriculture and Botany.  
 September. Ghent. — The International Congress of Horticulture has been postponed to the month of September. Address the Secretary's Office : 79 Avenue Chazal, Brussels.

*France.*

1913. August 20-24. Clermont-Ferrand. — Seventh Congress of Agricultural Cooperation and Mutual Help. Apply to Clermont-Ferrand, 5 Rue de la Treille.

October -13. Ajaccio. — International Congress of Olive Growers, organized by the Société Nationale d'Oleiculture de France.

October 16-19. Avignon. — Twenty-seventh Congress of Popular Credit (Agricultural Credit and Urban popular Credit. For adhesions to the Congress address before September 15: M. Maurice Dufourmantelle, Secrétaire du Centre Fédératif, Paris, 95 Rue Kléber.

*Germany.*

1913. September 3-6. Breslau. — General meeting of the Deutsche Bunsengesellschaft.

September 18-20. Hamburg. — Thirty-sixth general meeting of the "Verein zur Wehrung der Interessen der Chemischen Industrie Deutschlands".

1915. Munich. — International Congress of Brewery Workmen.

*Italy.*

1913. September 22-26. Siena. — Seventh Meeting of the "Società Italiana per il Progresso delle Scienze".

*Spain.*

1913. September. Soria. — Agricultural Congress.

*Switzerland.*

1914. June 8-10. Bern. — Sixth International Dairy Congress, organized by the "Association Universelle de l'Industrie Laitière".

*United States.*

October 1-4. Atlantic City, N. J. — 53rd. Annual Convention of the U. S. Brewers' Association.

October 9-11. Pittsburgh, Pa. Annual Convention of the U. S. Master Brewers' Association.

## CROPS AND CULTIVATION.

AGRICULTURAL  
METEOROLOGY

909 — **Evaporation from a Free Water Surface at Lincoln, Nebraska.** — LOVELAND G. A. and PERIN, S. W. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 193-197. Lincoln, Nebraska, 1912.

The evaporimeter used at the Nebraska Experiment Station consists of a galvanised iron pan 3 feet square and 10 inches deep floated on a tank by means of two iron pontoons. A graduated scale is adjusted to the outside of the pan and the evaporation is read off daily on the scale, the pan being refilled several times a month. The data obtained during the summer months of the years 1895-1910 are tabulated, together with the records of rainfall, temperature and wind velocity.

910 — **Evaporation from a Plain Water Surface.** — LEATHER, J. W. in *Memoirs of the Department of Agriculture in India, Chemical Series*, Vol. III, No. 1, pp. 1-15. Calcutta, May 1913.

A description is given of the evaporimeter in use at Pusa which consists essentially of a circular cement tank 6 ½ feet in diameter and 5 feet deep, with an adjustable pointer for measuring the water level. Records for 1911 and 1912 are tabulated and compared with other data obtained from the observatories at Madras and Lyallpur. The total evaporation was 4.15 feet

per annum at Pusa, 6.42 feet at Lyallpur, and 6.34 feet at Madras, but its distribution between hot and cold weather varied considerably with each point of observation.

911. — **Cupric Treatments and the Nitrification of the Soil.** — FATUREL, G. (Director of the Agricultural Station of Saône-et-Loire) in *Le Progrès agricole et viticole*, Year 30, No. 23, pp. 711-714. Montpellier, June 8, 1913.

SOIL PHYSICS,  
CHEMISTRY  
AND  
MICROBIOLOGY

Vineyard soil receives annually a varying amount of copper salts owing to the use of cupric washes as a protection against cryptogamic diseases. Different opinions are held with regard to the probable influence of this treatment upon the fertility of the vineyards. Apart from a possible catalytic action, the accumulation of a certain amount of copper in the soil might be injurious to nitrification. In order to investigate the matter, the writer made the following series of experiments.

Five funnels were each filled with 500 gm. of fine, loamy air-dry soil, containing only 3 per cent. of calcium carbonate; 0.5 gm. of ammonium sulphate were added, and the whole was watered with solutions of copper sulphate, so as to introduce the following amounts :

1. None.
2. 10 gm. of copper sulphate (2 % of the soil)
3. 5 gm.       "       "       (1 %       "       ")
4. 1 gm.       "       "       (0.2 %       "       ")
5. 0.5 gm.     "       "       (0.1 %       "       ")

The funnels were placed on receptacles and kept from February 26 to April 20 at a suitable degree of moisture in a warm room.

The amount of nitrified nitrogen was then determined; the soils were methodically washed, and 500 cm. of drainage water was collected from each, which, when analysed, gave the following results :

	Nitrified nitrogen mgm.
1. Control . . . . .	103.8
2. 2 % of copper sulphate . . . . .	62.0
3. 1 %       "       " . . . . .	71.3
4. 0.2 %     "       " . . . . .	88.1
5. 0.1 %     "       " . . . . .	94.5

Assuming that the nitrification of the control was almost complete (103.8 mgm. in place of 105 mgm. furnished by 0.5 gr. of ammonium sulphate), the conclusions are that :

I. The presence in soil of copper salts affords no special obstacle to nitrification : with above 2 per cent. of copper salts, the nitric nitrogen was still 60 per cent. of that contained in the control, and with 0.1 per cent. of copper sulphate, the nitric nitrogen rose to 90 per cent. of that in the control.

II. Copper salts, introduced into the soil, rapidly assume an insoluble form when in contact with calcium carbonate, iron oxide, and

alumina, which accounts for their weak inhibitive action on nitrification, even when large quantities are employed.

Finally, seeing that the copper which finds its way into the soil from the alkaline washes is already in an insoluble condition, there is thus no reason to apprehend injurious results from the frequent use of cupric washes.

PERMANENT  
IMPROVEMENTS  
DRAINAGE AND  
IRRIGATION

912. — **New System for Draining Land and Freeing it from Salt.** — MOSSELI, V in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, Vol. XII, Parts III and IV, pp. 215-239, Montpellier, 1913

This system of drainage shown in the accompanying Plate is applicable wherever the surface of the soil is somewhat higher than the level of the water in the main drainage canal, so as to allow a good drainage of the surface water, without however allowing a good drainage of the subsoil.

*Principle of the System.* — This new system, which is a combination of draining the soil and freeing it from salt, is carried out as follows: a collecting ditch (C) 50 to 60 inches deep is opened between the field (A) and the main drainage canal (B). The water collected by the ditches in the field is led into the main canal by means of small wooden or iron pipes and a pump is situated at the end of the collecting ditch C. By this arrangement a part of the water, namely that which percolates through the soil, is raised by the pump and thus got rid of, while the remaining water flows along the surface. The installation required by this system is simple and not costly.

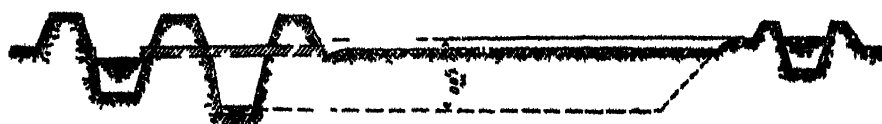
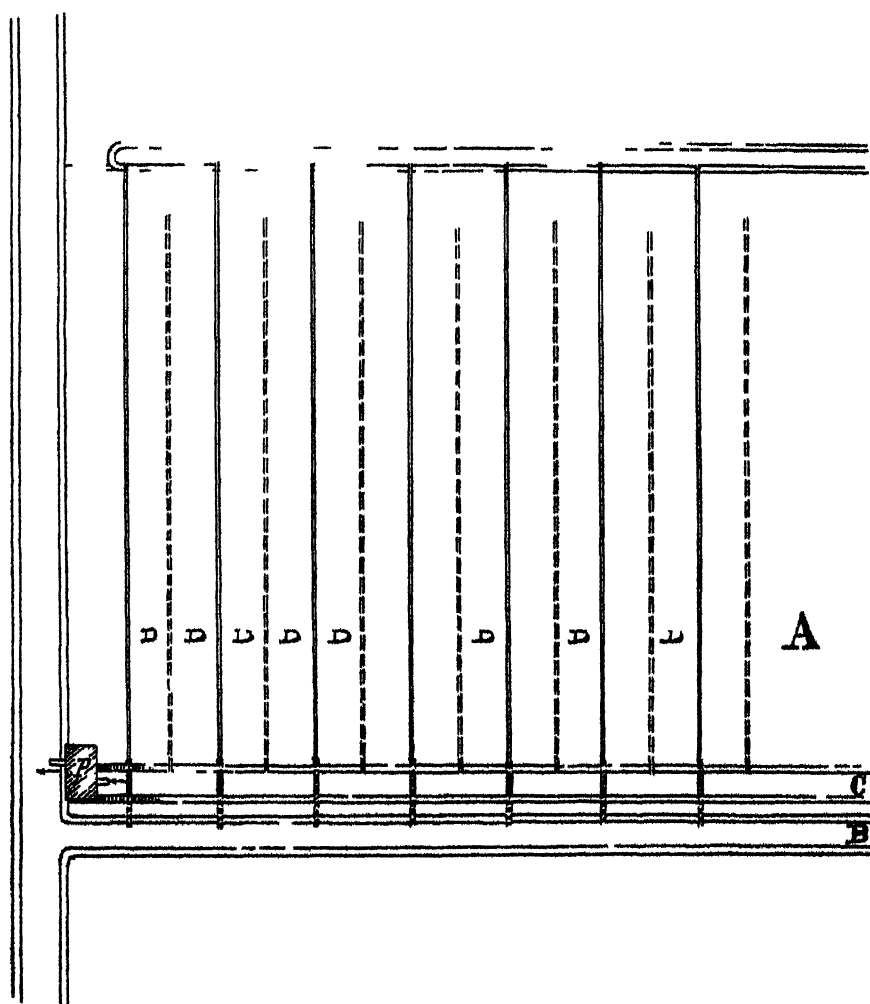
*Application of the system.* — It has been applied for the last four years in the irrigation of rice fields in the northern parts of Lower Egypt. The results obtained in 1909 and 1910 have been communicated to the "Institut Egyptien" (1). In 1911 the system was extended to an estate of 1729 acres.

*Network of drains.* — The drainage ditches must be at least 36 inches deep. A depth of 44 inches appears to be sufficient. The observations made, following Delacroix's method, have shown that these ditches must be excavated at 66 to 132 feet from each other, the distance varying with the greater or lesser permeability of the soil, its degree of saltiness and the rapidity with which it is desired to free the land from salt. The strips of land (D) should not be longer than 670 feet; the most advantageous length would be about 500 feet. The collecting drains that lead to the pumps should not have a fall inferior to 0.25 per 1000.

*Pumping station. Amount of infiltration water.* — In order to calculate the power of the pumps it is indispensable to know the amount of water drained per acre and per day. The formulae of Slichter and of King based on the laws of Poiseuille and Darcy allow an approximate estimation to

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(1) VICTOR MOSSELI. Note sur un nouveau dispositif pour l'évacuation des eaux de drainage et d'assainissement. — *Bulletin de l'Institut Egyptien*. Vol. III, 5th Series, 1908, pp. 101-119; and Nouvelles observations sur le système de lavage superficiel et drainage combinés; *Ibid.* Vol. V, pp. 102-136.



Plan and section showing new system for draining land and freeing it from salt.



be made of the quantity of water that can percolate through the soil in a given time. A direct determination may also be made by means of suitable apparatus. The experiments made in 1910 gave as an average 400 cubic feet of water per acre in 24 hours during the period of low water and 543 cub. ft. during the high water period, and this with the ditches at 133 ft. from each other. When this distance was reduced to 66 feet the amount of water rose to 686 cub. ft. during the high water period. In 1911 at the same period and with 66 feet between the ditches the amount of water ranged from 372 to 686 cub. ft.

*Results.* — The amount of water removed by pumping in the above described drainage installation was only one half to two fifths of that which would have to be pumped according to the usual system. Further, the water removed is 10 to 100 times richer in salt than that removed by surface drainage.

Naturally these figures are not absolute, they only give a general idea of this new process. The results obtained on each of the seven sections at Ezbeh Baharieh have been collected in 14 tables and presented to the "Institut Egyptien" (1). The writer gives as a specimen 4 tables referring to sections 6 and 7.

*Cost.* — This system compared with the usual system of drainage entails a somewhat greater expense and a slight diminution of the cultivable area owing to the larger number of ditches. The expenses of installation and upkeep are also heavier; the difference however is not considerable. The loss of cultivable area is between 2 and 3 per cent. The greater expense of installation is about 13s to 14s 6d per acre if wooden pipes are used and 19s to 21s if iron ones are used. The increase in the upkeep rarely exceeds 5 to 10 per cent.

913 — **Drainage Experiments in Belgium.** — *Expériences d'agriculture organisées à l'école de bienfaisance de l'Etat à Ypres en 1912.* — *Ministère de l'Agriculture et des Travaux Publics, Rapports et Communications*, No. 5, pp. 75-72. Brussels, 1913.

The object of these experiments was to ascertain the most advantageous depth of the drains in silty soils. The field to be drained is 2.47 acres in extent and is divided into four sections each of 0.62 acre.

Plot	Depth of drain	ft. 8 in.	Distance between the drains	33 ft. 4 in.
" 2	"	4 ft. 0 in	"	"
" 3	"	3 ft. 4 in	"	"
" 4	"	2 ft. 8 in	"	"

The field was drained at the end of March 1912 and on April 12 it was planted with potatoes. Every plot contained 52 rows. The seed-potatoes were laid by hand in their holes; the selection and grading was done very carefully. The weather was very rainy. The crop was lifted on Septem-

(1) V. MOSSENI. Nouvelles observations sur le système de lavage superficiel et drainage combinés. — *Bulletin de l'Institut Egyptien*, Vol. 5, pp. 102-136.

ber 28 and 30, each plot being harvested separately, and the potatoes were graded into large, small and diseased, each kind being weighed by itself.

The following table shows the results.

Number of Plot	I	II	III	IV
Depth of Drain	4 ft. 8 in.	4 ft. 0 in.	3 ft. 4 in.	2 ft. 8 in.
	cwt.	cwt.	cwt.	cwt.
Large potatoes . . . . .	79.30	83.83	102.85	96.92
Small . . . . .	16.52	15.69	15.78	14.49
Diseased . . . . .	14.64	12.83	9.60	10.23
Total yield . . . . .	110.46	112.35	128.23	121.64
Yield per acre . . . . .	178.84	181.87	207.58	196.91

The third plot, in which the drains were at a depth of 40 inches, gave the greatest yield and the smallest quantity of diseased potatoes.

914 — **Warping in England.** — STEPHENSON, J. in *Journal of the Royal Agricultural Society of England*, Vol 73, pp. 104-113. London, 1912

Arthur Young describes the process of warping in the following words : "The water of the tides that come up the Trent, Ouse, Don, and other rivers which empty themselves into the great estuary of the Humber, is muddy to an excess, insomuch that in summer, if a cylindrical glass twelve or fifteen inches long be filled with it, it will presently deposit one inch, and sometimes more, of what is called "warp". Where warp comes from is a dispute. The Humber at its south is clear water ; and no floods in the countries washed by warp rivers bring it, but on the contrary do much mischief by spoiling the warp. In the very driest seasons and longest droughts it is best and most plentiful. The improvement is perfectly simple and consists in nothing more than letting in the tide at high water to deposit the warp and permitting it to run off again as the tide falls ; this is the aim and effect".

The system probably dates from about 1730, and though found to a limited extent in other parts of the country, extensive areas are met with only in North Lincolnshire and South-East Yorkshire where it covers roughly about 300 square miles.

In olden times, the high tides used to overflow onto either side of the river bed, and the water, having deposited its sediment, drained off onto the low lands further away. When the rivers were banked in, strips  $\frac{1}{4}$  to  $\frac{1}{2}$  a mile wide on either side became fertile tracts of land which were greatly esteemed as they were well drained and produced good crops in all seasons. Behind these strips there exist tracts of lower land waterlogged

owing to their being below the level of the river. Such land, which is of little value in its natural condition, immediately becomes valuable if it can be covered with a thick coating of warp, and if not too distant from the river it may be subjected to the process. The area is surrounded by a bank and connected with the river bed by means of a warping channel which is provided with sluice gates. The richly charged tide water is then led into the basin as the tide rises, deposits its sediment and runs out again as clear water on the cbb. The process is carried out twice a day during the spring tides (i.e. the highest tides) of the summer months, but not in the late summer or in winter, and as each flooding may result in a deposit of an eighth of an inch when dry, in 2 or 3 years the surface may be raised 2 to 3 feet. The flooding is then stopped and white clover is sown. Whilst under that crop the land is drained by means of ditches discharging into the warping channel which thus becomes a main arterial drain. Later the land is cut up into farms of 150 to 200 acres, buildings are erected and the farms are let at £2 per acre or more.

One district deserves special mention and that is Thorne Moors. Covering an area of 16 square miles between the rivers Trent and Ouse, it is a comparatively high piece of peat land, which until recently was a dangerous swamp. It has now been dried by means of deep ditches and the peat is being exploited commercially. At the same time the removal of the peat lowers the surface of the soil and thus renders it available for warping and ultimate cultivation.

The cost of reclamation by warping varies within wide limits according to general conditions. It is naturally reduced if the sluices, which form one of the heaviest expenses, can be made to serve for a very large tract of land, say two or three thousand acres. In the case of Thorne Moors the cost has been estimated at £20 per acre, which includes the cost of preparing the land for farming but not the erection of buildings; this estimate would probably be lower than most as the circumstances in this undertaking are especially favourable.

Warp land on the whole is very well farmed and first rate crops are obtained. Potatoes are the most important crop, being highly manured and producing 10 to 12 tons per acre. They are followed by wheat which yields 8 to 9 quarters per acre and then by a root or forage crop. Sheep are the exception on warp farms, but cattle are kept, and a large number of pigs are reared and fed to provide an economical means of disposing of waste and diseased potatoes.

915 — **Irrigation Experiments at the Experimental Farm of the Royal-Imperial College of Agriculture at Gross-Enzersdorf (Austria).** — *Zentralblatt für Landwirtschaft*, Year 93, No. 9, pp. 101-112. Brünn, May 1, 1913.

The area to be irrigated was a 10 acre field of lucerne, which at the beginning of the operations, was in its fourth year. As levelling was impossible, and the nature of the ground precluded the use of irrigation channels, the field had to be flooded. The experiments were made in 1908, 1909 and 1910. The five years' precipitation observations made at the experimental farm showed a normal deficit in the rainfall accentuated

by the unfavourable distribution of the rains. Underground water only could be employed for irrigation, as surface-streams were lacking. The water was raised by means of centrifugal pumps driven by benzine-motors. Of the 10 acres, an area of 1 hectare (2.47 acres) was selected for experiment. This was divided into 10 plots of a quarter of an acre each. One plot remained unirrigated and acted as control. The other plots were so irrigated that three received about 148 000 cu. ft. of water during the vegetative period, three received 258 000 cu. ft., while the other three were only irrigated in the autumn. All the lots were manured alike,

The following results were obtained :

On the unirrigated plot, there was a close relation between the temperature and the time of harvest and also between the rainfall and the amount of the crop. This plot yielded three crops with 28 cwt. of dry substance per acre. Only the first crop was satisfactory, the others being poor and unreliable.

Four crops, however, were obtained from the irrigated plots, the average results being as follows :

1. Plots irrigated during the vegetative period with 148 000 cu. ft. of water produced 4 tons of dry matter per acre.
2. Plots irrigated during the vegetative period with 258 000 cu. ft. of water yielded 3 tons of dry matter per acre.
3. Plots which were only irrigated in the autumn yielded  $3\frac{1}{2}$  tons of dry matter per acre.

Thus an excess of moisture caused a decrease in the crop. The technical preliminary investigations were carried out by the prof. of agriculture at the College, Dr. R. Fischer (Civil Engineer).

916 - **Irrigation Experiments with Brackish Water.** — Report of Prof. ORESTE BORDIGA to the President of the Italian Royal Irrigation Commission. In IV°, pp. 22, 1913.

In the Province of Bari there is a strip of cultivated land along the Adriatic coast irrigated by water which is perceptibly brackish owing to infiltration of sea water through the crevices of the limestone subsoil. This land is chiefly under tomatoes, but various brassicas, capsicums, the egg-plant, and even in some places cotton, are also cultivated. Owing to this fact, in 1911, a Royal Commission on Irrigation recommended that a series of experiments should be undertaken using water of different degrees of salinity, in order to ascertain whether it would be possible to utilize brackish water for irrigation on a large scale. The experiments were carried out in 1912 by the Station of Agricultural Chemistry of the Royal College of Agriculture at Portici in the district of Vitulazio near Capua. Pot cultures were adopted and brackish water from the Province of Bari was used.

The analyses of 30 samples of this water are given. Its composition varies. In the case of the minimum salinity, the dry residue at 120° C. was 0.272 per cent., the chlorides calculated as NaCl were 0.1606 per cent., and the carbonates calculated as  $\text{Na}_2\text{CO}_3$  were 0.0424 per cent. In the case of the maximum salinity the dry residue at 120° C. was 0.802 per cent., the chlorides calculated as NaCl were 0.588 per cent., and the car-

bonates calculated as  $\text{Na}_2\text{CO}_3$  were 0.0466 per cent. Detailed analyses of the soil too are given, showing that it was clayey, and good both with regard to its mechanical structure and its chemical composition; and analyses are also given of the water used for the experiments (dry residue at  $100^\circ\text{C}$ , 0.7389 per cent; at  $180^\circ\text{C}$ , 0.684 per cent.).

The trials were begun late in the season (July); they were therefore only regarded by the writers as preliminary, and will be continued. Nevertheless the results obtained up to the present are tabulated in great detail. Seeds of cotton, chicory, maize and tomatoes were planted in zinc vessels, each containing 82 to 84 kilos (180 to 185 lbs.) of soil, and manured by the addition of 12 grams of bicalcic phosphate and the same amount of ammonium sulphate. The cotton and chicory died off, and were discarded, but the other two were each watered with four different solutions:

- a) pure water (from Serino);
- b) water containing  $\frac{1}{4}$  of the total salts (0.1847 per cent);
- c) water "  $\frac{1}{2}$  " (0.369 " );
- d) water "  $\frac{3}{4}$  " (0.5541 " );
- e) water " total salts (0.7389 " ).

The plants were watered when they appeared to need it, and received every time sufficient to form a stratum of from 1.2 to 3.6 cm. deep, the total amount received being 36.6 cm. in the case of the maize, and 33.6 cm. in that of the tomatoes. The cultures were sheltered from rain.

During the vegetative period the maize plants appeared to suffer from the salts, especially when they were present in the larger quantities, while on the other hand, the tomatoes seemed in no wise affected by the salts added to the soil, although these were present in the proportion of 5 tons per acre in the receptacles watered with the strongest solution. The area of each pot was 1.8 sq. ft. and there were 3 plants of maize or 2 to 3 tomato plants in each. At harvest-time (October 26) the results obtained were as follows:

Watered with	fresh water	$\frac{1}{4}$ strength	$\frac{1}{2}$ strength	$\frac{3}{4}$ strength	undiluted
	grams	grams	grams	grams	grams
<i>Maize:</i>					
total average weight of each plant . . . . .	46.5	32.8	28.15	26.15	28.7
<i>Tomatoes:</i>					
total average weight of each plant . . . . .	105.9	58.45	67.1	56.8	97.0
average weight of fruit of each plant. . . . .	101.6	57.4	62.8	53.4	93.6

In the case of maize the yield decreased with an increase in the salt; in the case of the tomatoes, the maximum weight of plant was obtained with least salt, but the weight of fruit obtained with the maximum amount of salt was greater than that obtained with the smaller doses, though smaller than when fresh water alone was used. With reservations as to the reliability of the results when calculated into yields per acre, the writers note that maize irrigated with fresh water yielded within four months at the rate of 50 cwt. of dry matter per acre, and when irrigated with entirely brackish water the yield was a little less than half. Tomatoes with fresh water yielded at the rate of 18.3 cwt. of dried stems and leaves per acre and 121 cwt. of fruit per acre, while with wholly brackish water the weight of the dried stems and leaves would be 20.3 cwt. and that of the fruit 111.5 cwt.

In subsequent experiments cotton and lucerne will be used, as well as the two above-mentioned plants.

MANURES  
AND  
MANURING

917 - **Fertilizer Experiments on Peaty Meadows in Hungary.** — GYÁRFÁS, JÓZSEF, in *Köztud.*, Year 23, No. 43, pp. 1553-1554, Budapest, June 7, 1913.

Repeated manurial experiments on peaty meadows carried out at the Royal Agricultural Station of Magyaróvár had shown the efficiency of phospho-potassic manures for increasing the yield of hay both qualitatively and quantitatively, and in 1909 in order to popularise the use of this class of fertilizer on the peaty meadows of Hungary, the Experimental Station undertook a series of new trials, partly on the grass lands at Hanság bordering the Lake of Balaton, and partly on the land belonging to the local government at Haromszék. For each trial two plots of 1 katastral joch (1.42 acres) each were selected; one acted as control and the other received 440 lbs. of superphosphate and 165 lbs. of 40 % potassic fertilizer (3 cwt. of superphosphate and 1 cwt. of potassic fertilizer per acre). Trials were made in 40 different places, but of these only 24 gave reliable results, which may be divided into 3 groups showing the effect of the manures on the yield of hay 1, 2, and 3 years after the application of the manures. The figures are given in the adjoining table.

The mean increases in yield show that peaty meadows answer readily to the application of fertilizer, the increased yield per acre amounting to 15.2 cwt. the first year (mean of 24 experiments), 9.4 cwt. the second year (mean of 17 experiments), and 5.0 cwt. the third year. The cost of the above dressing should not be above £1 10s per acre, and if the hay be valued at 1s 9d per cwt. the application of the phospho-potassic dressing is evidently highly remunerative.

No.	Locality	Increased yields of hay per acre due to manuring			
		1910 cwt.	1911 cwt.	1912 cwt.	Total cwt
<i>Results of 1 year</i>					
1	Mosonszentpéter I . . . . .	16.7	—	—	—
2	» II . . . . .	19.3	—	—	—
3	Mosontétény I . . . . .	26.5	—	—	—
4	» II . . . . .	16.7	—	—	—
5	» III . . . . .	29.9	—	—	—
6	Igricze . . . . .	13.9	—	—	—
7	Lukafa . . . . .	6.3	—	—	—
	Mean . . .	17.7	—	—	—
<i>Results of 2 years</i>					
8	Mosonszentpéter III. . . . .	13.2	15.2	—	28.4
9	» IV . . . . .	13.9	19.3	—	33.2
10	» V . . . . .	66.8	19.3	—	86.1
11	Mosonszentjános I . . . . .	7.0	8.3	—	15.3
12	» II . . . . .	8.3	13.9	—	22.2
13	Mosontarcsa I . . . . .	10.0	15.8	—	31.8
14	Tapolca . . . . .	13.9	13.9	—	27.8
15	Pötréte . . . . .	1.3	5.8	—	10.1
16	Kézilimartonfalva . . . . .	2.2	8.9	—	10.2
	Mean . . .	16.2	13.3	—	29.5
<i>Results of 3 years</i>					
17	Léibeny I . . . . .	6.3	3.6	4.1	14.0
18	» II . . . . .	12.6	14.7	14.5	41.8
19	» III . . . . .	9.3	9.1	5.5	23.9
20	Mosontarcsa II . . . . .	28.5	3.4	7.0	38.9
21	Bak . . . . .	16.7	6.7	4.1	27.5
22	Zalaapát . . . . .	8.0	1.6	1.0	10.6
23	Esztergály . . . . .	10.5	3.6	1.9	16.0
24	Báránd . . . . .	6.6	1.2	2.5	13.3
	Mean . . .	12.3	5.9	5.0	33.2
	Total means . . .	15.2	9.4	5.0	—

918 - **New Experiments on the Utilization of Phosphates in Russia.** — 1. KOTCHEKOV, V. in *Izvestia Moskovskogo Sel'skokhoziaistvennogo Instituta*, Year XIX, Part I, pp. 33-55, 55-59, 60-68, 69-72 and 205-222. Moscow, 1913 — 2. PIRITOURIN, TH. T. *Ibid.*, pp. 142-151. — 3. JAKOUSHKIN, I. V. *Ibid.*, pp. 152-178. — 4. GALZEV, P. E. and JAKOUSHKIN, I. V. *Ibid.*, pp. 193-204 and 223-232.

The above papers describe the continuation of experiments made in Prof. Prianishnikov's laboratory at the Moscow Agricultural Institute, with the object of utilizing the poor phosphates of Central and Eastern Russia (1).

M. Kotchekov reports experiments, made at the instigation of Prof. Prianishnikov, on the use of sodium bisulphate (industrial residue from the manufacture of nitric acid) in concentrated solutions ( $D = 1.475$ ) for treating Viatka phosphates (57.7 per cent. tricalcic phosphate) and Smolensk phosphates (32.6 per cent. tricalcic phosphate), dissolving respectively 97 and 95 per cent of the total phosphoric acid. On treating the solution with milk of lime, a precipitated phosphate was obtained containing an average of 25.3 per cent. of  $P_2O_5$  of which 92.6 per cent. was soluble in Petermann's ammonium citrate; the Viatka phosphate alone gave 37 per cent., with 91.5 per cent. citrate-soluble, while the Smolensk gave 22 to 34.4 per cent. and 98 to 66 per cent. citrate soluble.

The residue from the manufacture of trinitrotoluene contains, after the third nitration, an average of 62 to 72 per cent. of sulphuric acid, 2 to 3 per cent. of nitric acid, and 0.3 per cent. of organic matter. The results of experiments in preparing superphosphates from Viatka phosphates by means of this residue and by ordinary sulphuric acid are given in Table I.

TABLE I.

	Nitro superphosphate			Ordinary superphosphate				
	No. 122		No. 154	No. 31		No. 32		No. 34
	Not dried	Dried at 45°		Not dried	Dried at 85°	Not dried	Dried at 85°	
Sulphuric acid at 52° Beaumé used for treating 20 parts of phosphate . .								
	13.2		13.2	13		13.5		14.0

*Analysis of the superphosphates (calculated on the dry matter)*

Total $P_2O_5$ . . . . .	17.2	17.3	17.9	17.1	17.0	16.8	16.8	17.1
Citrate-soluble $P_2O_5$ . .	—	—	—	16.1	16.2	16.7	16.3	16.7
Water-soluble $P_2O_5$ . .	15.24	13.7	15.4	12.9	12.6	11.0	13.7	14.4

The analyses show the good quality of the nitrosuperphosphates, which are also drier and more powdery than the ordinary super.

Fresh experiments were undertaken on the preparation of double superphosphates by using sodium bisulphate. Superphosphate prepared from Viatka phosphates and sodium bisulphate was dissolved, and the filtered solution was concentrated on a water-bath, the crystals of sodium sulphate formed being removed. When concentrated to 45° Beaumé the solution contained 20 to 22 gms. of  $P_2O_5$  per litre and attacked degelatinized bone dust vigorously; by this means a double superphosphate was formed containing up to 24.3 or 25.6 per cent. of  $P_2O_5$ , of which 98.3 or 92 per cent. was water-soluble; this product contained some sodium sulphate but its physical properties were satisfactory.

Experiments were made on the preparation of superphosphates with the sulphuric acid residue from the purification of petrol. This residue contained 931 gms. of sulphuric acid per litre, with a density of 49.6° Beaumé; it was used on amounts between 50 gms. and 2 kg. of degelatinized bone dust and Viatka phosphate, and on a larger scale on 20 kg. of Viatka phosphate. The phosphoric acid of the bones was almost completely dissolved, and the result was a superphosphate containing 21.25 per cent. of total  $P_2O_5$  and 21.12 per cent. water-soluble; the super from the Viatka phosphates contained 14.27 per cent. of total  $P_2O_5$  and 12.74 per cent. water soluble. Both the products were sufficiently dry and powdery.

M. Peritourin has studied the conditions of equilibrium occurring during the preparation of double superphosphate by means of sodium bisulphate. For this purpose phosphoric acid and sodium sulphate were dissolved in the proportions in which they are formed when calcium phosphate is treated with sodium bisulphate; as the evaporation over the water-bath proceeded, recrystallization of sodium sulphate with a little monosodium phosphate took place; at a density of 1.40, only 5 per cent. of the  $P_2O_5$  had precipitated.

Following previous culture experiments in Prof. Priamishnikov's laboratory, M. Jakoushkin has carried out sand-cultures of oats, barley, wheat and millet for three years; he has confirmed the fact that certain Russian phosphates may serve directly as a source of phosphoric acid for Gramineae. Senguiley phosphates give results only a third below those with soluble phosphates. Other phosphorites from the governments of Simbirsk and Saratov have proved to be utilisable by Gramineae, if not totally, at least to the same extent as the Senguiley phosphates, as regards the nearly insoluble protein phosphorus of plants. These phosphorites come from the Gault, but not all phosphorites of the Cretaceous period possess this valuable property. These phosphorites are highly soluble in ammonium citrate (Wagner's or Petermann's). By three extractions with Wagner's reagent about 20 per cent. of the  $P_2O_5$  was obtained from an ordinary phosphorite, and over 50 per cent. from the Senguiley phosphorite. Petermann's reagent extracted 14 per cent. of the  $P_2O_5$  from Senguiley phosphorite, but only traces from an ordinary mineral phosphate. These results encourage the hope that cer-

tain mineral phosphates of the Albian (Gault) series may be used directly as manure.

Pot cultures in sand carried out by MM. Galzev and Jakoushkin, with plants possessing considerable power of assimilating phosphoric acid (lupins, buckwheat, mustard), confirm the comparatively easy assimilability of the Albian phosphates, and in particular of those from Senguiley.

Some of the results are shown in Table II.

TABLE II.  
*P<sub>2</sub> O<sub>5</sub> in the crop, mgm. per pot.*

Phosphorite	Yellow lupins		Buckwheat
	I.	II.	
Senguiley (Gault) . . . . .	60.96	96.89	102.0
Sinenkije (Gault) . . . . .	—	82.13	—
Mangishlak (Gault) . . . . .	—	—	77.1
Penza (Neocomian) . . . . .	41.92	—	—
Durman (Turonian) . . . . .	20.45	—	—
Burluk (Turonian) . . . . .	—	43.75	71.5
Novoselki (Rjasen) . . . . .	—	—	49.5
Kusjminski (Rjasen) . . . . .	—	—	27.5

Using cultures in pots containing 4 kg. of sand, M. Kotchekov studied the comparative action of the phosphoric acid soluble in ammonium citrate of the various phosphatic manures. In the fourteen series of experiments with flax, oats and millet, the nutritive elements were used in the usual quantities, except in the case of phosphoric acid, which was given at half the strength so that any lack of it would show up better. The amount added was 0.142 gm. of P<sub>2</sub> O<sub>5</sub>, either dissolved in citric acid, or citric acid and water, or in an insoluble form. Table III shows the phosphatic manures used.

The experiments showed that the value of the phosphoric acid soluble in Petermann's ammonium citrate varies considerably. Thus the action of that from basic slag and precipitated phosphates was excellent, while that from washed superphosphate and bone dust was almost none. Exceptions were given by washed Viatka superphosphate, which had a satisfactory action, and Smolensk precipitated phosphate (obtained by the use of sodium bisulphate and first product of precipitation by lime), which had an unfavourable action.

TABLE III.

	$P_2 O_5$		
	total	soluble in citrate and water	soluble in water
<i>1911 Experiments.</i>			
1. Ordinary superphosphate . . . . .	—	17.9	16.9
2. Kostroma superphosphate . . . . .	—	14.2	10.1
3. Id. water washed . . . . .	—	4.2	—
4. Precipitated phosphate . . . . .	40.1	37.4	—
5. Id. from Smolensk . . . . .	43.9	28.3	—
6. Basic slag . . . . .	13.5	—	—
7. Degelatinized bone dust . . . . .	13.2	2.2	—
<i>1912 Experiments.</i>			
8. Carolina superphosphate . . . . .	—	15.9	12.5
9. Id. washed in water and calculated as citrate-soluble $P_2 O_5$ . . . . .	—	—	—
10. Viatka superphosphate . . . . .	—	14.7	12.5
11. Id. washed . . . . .	—	—	—
12. Washing water from 11. . . . .	—	—	—
13. Precipitated Smolensk phosphate, pre- pared with sodium bisulphate. . . . .	34.4	23.6	—
14. Basic slag . . . . .	13.5	4.8	—
15. Id. soluble in Wagner's citrate. . . . .	—	10.8	—

MM. Galzev and Jakoushkin have carried on experiments for three years on the action of pyrites and its oxidation products. These have shown that the breaking down of the pyrites cannot be counted on during the period of growth; mixtures of pyrites and phosphorite gave no increase in the assimilation of phosphates by oats. But altered pyrites, containing sulphates and sulphuric acid, exercises a dissolving action on phosphorites. In normal Hellriegel cultures both ferrous and ferric sulphates increase the assimilation of phosphates.

Considering the importance for Russian agriculture of a local supply of phosphatic manures, these investigations have shown that Russian phosphorites, in spite of their relative poverty, present possibilities of economic utilization a) by treatment with residues of other industries, b) by direct use of those specially suitable for the purpose.

919 — **The Phosphate Question in Tunis.** — BERTAINGHAUD, E. (Director of the Official Laboratory for Agricultural and Industrial Chemistry in Tunis). Les Phosphates Tunisiens: leur Origine et leur Assimilabilité. Exportation de l'Acide Phosphorique par les Récoltes. — *Revue agricole et viticole de l'Afrique du Nord*, Vol. II, Nos. 54, 55, and 56, pp. 268-270, 292-297 and 323-325. Algiers, March 22 and 29, and April 5, 1913.

The soils of Tunis are generally poor in phosphoric acid, both as tri-basic phosphate and as assimilable phosphoric acid. The high lime content checks the dissolving action of the weak acids in the interstices of the soil.

Tunis is a cereal-exporting country, and though the reserves of fertility are considerable, the soil eventually becomes worn out, and the low yields show that these reserves are now considerably reduced.

The final estimates of the Food Supply Committee of the Regency fix the yield of wheat at 4 qx. per ha. (nearly 6 bu. of 60 lbs. per acre) over the whole area under cultivation; analyses made by the writer furnish the following data.

Cereals exported from Tunis during the period 1907-1912	$P_2O_5$ exported	
	% of grain	total
Wheat . . . . 126 320 tons	0.82	1 036 tons
Barley . . . . 356 600 "	0.72	2 568 "
Oats . . . . 244 400 "	0.55	1 344 "
		Total = 1 948 tons
Livestock exported from Tunis during the period 1907-1912	Weight of bones	$P_2O_5$ exported
583 113 head	4 393 tons	878 tons = 878 "
		Total $P_2O_5$ exported 5 826 tons

This amount represents a real loss for Tunis, as the corresponding imported products are consumed in the towns and leave no residues for agricultural use.

But Tunis possesses some of the most important deposits of phosphates in the world; only they cannot be used direct, even finely ground, owing to the amount of limestone in Tunisian soils, except the sandstone soils of Kroumiria.

In this connection, the writer remarks that, with an exportation of 1 828 000 tons of phosphate from Tunis in 1912, there is a mean annual importation for the period 1907-12 of 4601 tons of superphosphate, corresponding to 2037 tons of calcium phosphate (1).

(1) According to a report sent to us by the Director-General of Agriculture, Commerce and Colonization, a new local factory, with a potential output of 20 000 tons, put 10 000 tons on the market in 1912. This would account for the lowering of the importation from 9184 tons in 1911 to 2759 tons in 1912. See: *Production et consommation des engrais chimiques dans le monde*, pp. 66-69: Rome, 1913. (Ed.).

The average phosphoric acid content of soils in Tunis is 0.08 per cent; reckoning a density of 1.5 and a depth of 8 in. of ploughed soil, there would be 2130 lbs. of  $P_2 O_5$  per acre; to reach the 4450 lbs. given by Joulie for normal fertility, 2320 lbs. must be added; this would mean applying 6  $\frac{1}{2}$  tons of super at 16 per cent., or 3  $\frac{1}{2}$  tons of a phosphate at 30 per cent., making an expenditure of £ 16 or £ 6 per acre. But it would no doubt be sufficient to replace twice the amount removed: a good average crop of wheat of 26 bu. would remove 20 lbs. of  $P_2 O_5$ ; this could be replaced by 270 lbs. of superphosphate at 16 to 17 per cent., making (at present prices) a total cost of 7s 6d per acre. This would be amply repaid by 1  $\frac{1}{2}$  bushels increase in the crop of wheat, where as an excess of 6 bu. ought easily to be got (1).

In conclusion, the writer remarks that in Tunis superphosphates should be turned in by deep ploughing some time in advance, to give the best results.

920 - Consumption of Superphosphates in Hungary. — KOVÁCSY, BÉLA, in *Köztudós*, Year 23, No. 42, pp. 1532-1533. Budapest, June 4, 1913.

The above paper gives interesting data as to the consumption of superphosphates in Hungary, showing the average quantity used on a given area of cultivated land for every county, in 1907, 1911 and 1912.

The data, however, refer exclusively to the super produced in and sold by the factories affiliated to the Hungarian Association for the Use of Chemical Manures, and do not include the amounts imported; nor do they refer to other chemical manures. Superphosphate, however, is by far the most important manure in Hungary, its consumption reaching 80 per cent. of the total for chemical manures.

In a detailed table, the writer gives the figures collected in the 63 counties, dividing these into four groups according to the quantity used in 1911 and 1912. The figures of the three years show variations between  $\frac{3}{4}$  lb. and 72 lbs. per acre (0.5 kg. and 46.6 kg. per arpent cadastral), but on the whole show a marked progressive increase.

The following table shows the grouping of the counties for 1911 and 1912:

Group I. (8 counties): consumption more than 25 kg. per arpent cadastral (38 lbs. per acre).

Group II. (12 counties): more than 10 kg. per arp. (15 lbs. per acre).

Group III. (16 counties): more than 5 kg. per arp. (7  $\frac{1}{2}$  lbs. per acre).

Group IV. (27 counties): less than 5 kg. per arp. (7  $\frac{1}{2}$  lbs. per acre).

The total averages for the four groups, in lbs. per acre of cultivated land, are as follows:

	1907	1911	1912
Group I. . . . .	16.7	36.2	44.2
» II. . . . .	6.4	18.4	21.5
» III. . . . .	3.3	9.5	10.9
» IV. . . . .	1.0	3.0	3.4

(1) See No. 346, B, April 1913.

(Ed.).

921 - **Experiments with Radio-active Substances.** — BERTHAULT, E., BRULIGNÈRE, L. and BERTHAULT, P. in *Annales de l'Ecole Nationale d'Agriculture de Grignon, Travaux du Laboratoire d'Agriculture 1910-1911-1912*, Vol. III (Agriculture), pp. 1-62. Paris, 1912.

The writers remark that the question of radio-active manures is still very obscure; to test the matter for themselves they have made a series of laboratory experiments and culture trials (1).

*Laboratory experiments* — The introduction of uranium protoxide at 0.05 to 1 per cent. into Knop culture solutions had good effects on some plants (French beans), and markedly harmful effects on others (barley, maize); the results with barley suggest that the optimum amount of the radio-active substance had been passed.

A sample of radio-active manure sent by the Radium Bank was declared to have the following percentage composition; silica, 80.44; water and volatile organic matter, 10.54; oxides of iron and alumina, 2.20 total sulphuric acid, 5.40; soluble phosphoric acid, 1.37; soluble salts and soluble free acids, 3.32; uranium, traces; samples very variable, especially in free acids and phosphoric acid.

The writers found that this contained only 0.1109 per cent. of total phosphoric acid, and that the radio-active energy was less than 0.01 of mixed uranium oxide. In spite of its doubtful composition, it has given an increase in the fresh weight of wheat in culture experiments.

On the whole, this first series of experiments seems to show that in the first stages of growth of plants radio-active substances have a favourable action on the increase of green weight.

*Field experiments (1910-1911).* — The radio-active manures have been tried, according to the recommendations of the Radium Bank, in very small quantities as compared with other nutritive substances, chiefly at 2 or 3 per cent. of a dressing of superphosphate, but ranging from 1 to 10 per cent. The radio-active manure was applied alone, with superphosphate, with blood, with superphosphate and blood, and with superphosphate, blood and a potash manure. The following series of experiments were established: wheat (two series, one in pots); rye (one series); barley (two); oats (four); pulse crops (two); Leguminous fodder crops (one); fodder grasses (one); oil crops (four); flax (one); potatoes (two, one with old and fresh radio-active manure); Jerusalem artichokes and helianti (one).

The following table gives the number of experiments showing an excess (+) or a deficit (—) on the means of each series; the experiments with fresh radio active manure are not reckoned.

(1) See No. 781, *B.* May 1912; No. 1513, *B.* Nov. 1912; and No. 350, *B.* April 1913. (Ed.).

	Radio-active manure used				
	alone	with super	with blood	with super and blood	with complete manure
Total weight of crop . . . . .	6+, 8—	12+, 1=15—	1+, 1—	2+	2+, 1—
Straw, dried or green stems . .	7+, 6—	18+, 1=20—	1+	+	2+, 1—
Grain . . . . .	6+, 8—	17+, 22—	2+, 1—	2+, 1—	2
Tubers . . . . .	1+, 9—	4+, 2—	"	"	12+, 4—

The following conclusions may be drawn from these results :

a) Radio-active manures alone may or may not be advantageous ; the number of positive and negative results is about equal for the total weight of the plants, and for the stalks and grain, but the negative results are the more numerous for the tubers.

(b) The addition of radio-active manures to superphosphate is generally unfavourable, particularly for the grain ; for tubers, however, it is favourable. The following table shows the action of the radio-active manure when added in varying proportions to superphosphate.

	1 % (2½ and 3½ lbs. per acre)	2 % (5½ and 7½ lbs. per acre)	3 % (8 and 9 lbs. per acre)	5 and 6 % (11 and 18 lbs. per acre)	10 and 15 % (27, 36, 45 and 67 lbs. per acre)
Whole plant (stem and seed) .	4+, 3—	5+, 1=, 5—	2+	"	1+, 7—
Straw, dried or green stems . .	2+, 1=, 4—	6+, 3—	6+, 3—	1+, 2—	3+, 11—
Grain . . . . .	4+, 3—	5+, 6—	7+, 6—	"	1+, 7—
Tubers . . . . .	1+, 1—	1+, 1—	"	"	+

Radio-active manures at 1, 2 and 3 per cent. seem to have no effect, but at 10 and 15 per cent. the negative results increase, except for tubers, for which the figures are not decisive.

c) the addition of radio-active manure to dried blood was made in only a few experiments, but the positive results seem to predominate.

d) With the addition of radio-active manure to a mixture of superphosphate and dried blood, the positive results are the more numerous, both for stems or straw and for grain.

e) Lastly the addition of radio-active manure to a complete manure generally gives a larger yield, even of tubers.

These field trials do not allow practical conclusions to be drawn; further experiments are necessary. What seems certain is that it is not advantageous to employ as much as 18 or 45 lbs. of catalytic manure with superphosphate alone. Radio-active substances seem to be more efficacious in presence of a complete manure than with phosphatic or nitrogenous manuring only; in this case the best action is with dressings of 36 to 45 lbs per acre.

AGRICULTURAL  
BOTANY.  
CHEMISTRY  
AND  
PHYSIOLOGY  
OF PLANTS

922 - The Assimilating Energy of Plants Cultivated under Different Light Intensities. (1) - ROSE E in *Annales des Sciences Naturelles, Botanique* Vol. XVII, No. 1-1, pp. 1-110, Paris, April and May 1913.

While various investigators have examined the effect of light intensity on the development and structure of plants, others have studied assimilation under different degrees of illumination, and the present enquiry was undertaken to connect the two series of investigations. The experiments were carried out at the Biological Laboratory at Fontainebleau during the summer months June to September.

The subjects of the research were *Teucrium scorodonia* and *Pisum sativum* chosen as being typical shade and sun-loving plants respectively, and the various light intensities were obtained by using shelters covered with woven material of different textures. Five grades of light intensity or illumination were employed, as follows:

- I =  $\frac{1}{9}$  of the unshaded light  
 II =  $\frac{1}{8}$  " " "  
 III =  $\frac{1}{3}$  " " "  
 IV =  $\frac{3}{4}$  " " "  
 V = unshaded light.

The A. treats his results under five different headings:

*The influence of light intensity on the production of green and dry matter and also on the external appearance of the plants.*

Leaves were taken from *Teucrium scorodonia* at 3 different stages of the development of the plant and their area and green weight were determined. At the end of the experiment the whole plants were separated into root and shoot, and analysed for green and dry matter.

Both the weight and the area of the leaves were at their maximum in illumination III, but the weight per unit area, or in other words the thickness of the leaf was greatest in direct sunlight and diminished with each reduction of the light intensity. Turning to the effect on the plant as a whole, both green and dry weights diminished with each degree of shading while the water content increased, but the effect of decreasing

(1) See also No. 351 B April 1913.

## A) Leaves only.

Illumination	Area in cm <sup>2</sup>					Green weight. in mg.				
	I	II	III	IV	V	I	II	III	IV	V
<i>Teucrium scorodonia</i> :										
4 leaves developed . . .	—	0.1	0.2	0.2	0.1	—	5	8	9	5
6 " " . .	—	0.5	0.9	0.4	0.3	—	28	52	34	28
Adult plant . . . . .	0.2	5.1	6.5	3.6	1.2	7	285	405	312	126
<i>Pisum sativum</i> :										
2 leaves developed . . .	—	0.42	0.48	0.55	0.5	—	56	61	75	82
4 " " . .	—	1.0	1.4	1.7	1.2	—	82	135	173	159
Flowering . . . . .	—	1.2	1.6	2.7	2.7	—	92	123	280	180
Fruiting . . . . .	—	0.7	1.0	1.8	1.3	—	52	100	176	145

## B) Whole Plant.

	<i>Teucrium scorodonia</i>				<i>Pisum sativum</i>		
	II	III	IV	V	III	IV	V
Green weight . . . . . gms.	21.82	48.35	54.95	—	32.3	58.3	81.2
Dry " . . . . .	3.96	9.90	16.06	—	4.0	8.35	12.91
Shoot per cent of whole plant	91.00	88.00	80.4	70.9	—	—	—

the light acted in opposite directions on root and shoot respectively, the relative proportion of shoot increasing as the shade deepened. (1)

With *Pisum sativum* the leaves were measured and weighed at 4 different stages of plant development, and the general results resembled those obtained with *Teucrium scorodonia* only that *Pisum sativum* showed itself far less tolerant of shade, so that the optimum illumination for the development of the leaves shifted from III to IV, and, while the green

(1)	Illumination.	green wt. of plant, gms.	% shoot in plant	wt. of shoot, gms.
	III	48.35	88.0	42.5
	V	54.95	70.9	38.9

The aerial portion of the plant or, in other words, the *shoot* is therefore larger in illumination III than V. (Ed.).

weight per unit area (i. e. thickness) of the leaves at illumination II was only about  $\frac{2}{5}$  smaller than that of the leaves developed at illumination V in the case of *Teucrium scorodonia*; the green weight per unit area of the leaves developed at illumination V was twice as great as that of those developed at illumination II. Moreover when considering the development of the plant as a whole, the drop in green and dry weight for each degree of shading was much more sudden with *Pisum sativum* than with *Teucrium scorodonia*. *Pisum sativum* flowered and fruited in illuminations V and IV, and flowered but failed to fruit in illumination III; but in illumination II the plant was pathologically affected. *Teucrium scorodonia*, on the other hand, was apparently normal, though reduced in size, even in illumination II.

The chlorophyll content of the leaves was estimated by Lubimenko's colorimetric method. The results show that the chlorophyll content increased with shade and was higher in *Teucrium scorodonia* than in *Pisum sativum*, but in no case were the differences very large, and from observations made on *Pisum sativum* the variation appears to be due rather to a concentration of the pigment in the chloroleucites than to increased numbers of the latter.

Further the anatomy of the leaves was investigated and showed very marked differences especially in the case of *Teucrium scorodonia*. Leaves of the latter developed in the full light showed a very irregular surface and inconspicuous vascular bundles; when the light was reduced the leaf flattened out, became thinner, and the vascular bundles, especially the mid-rib, became larger and more prominent, with a still greater reduction of light the leaf became very attenuated. In the case of *Pisum sativum* no such differences were observed; the leaf merely got thinner; but in both cases the reduction of the palissade cells was remarked, first from two to one layers, and finally to none at all.

## 2) The measurement of the Assimilating-Energy.

This was carried out by placing a leaf in a wide test tube with a known volume of air and carbon dioxide, and measuring the amount of carbon dioxide which was absorbed in a given time (1 to 3 hours according to the rate of assimilation) the results being always expressed as cc. of carbon dioxide absorbed by 1 gm of green leaf in 1 hour, (CO<sub>2</sub> gramm-hour). These figures naturally represent the difference assimilation minus respiration, but some preliminary experiments where the latter was determined showed that the difference though smaller was of the same order as the real figure, and could quite well be used to express the variations observed in the behaviour of the leaves.

The atmosphere used contained about 10 per cent of carbon dioxide and the tests were carried out on bright days and during the hours of greatest light. Further a constant temperature was ensured by running cold water round the test tubes.

3) *Assimilating Energy of leaves in the same degree of light intensity as that in which they were developed.*

Cc. of CO <sub>2</sub> absorbed by 1 gm. of green leaf in 1 hour				
Stage in the development of the plant	1st 2 leaves developed	2nd 4 leaves developed	3rd flowering	4th fruiting
<i>Pisum Sativum</i>				
Developed and tested at ill. II	1.60	1.89	1.88	2.50
" " III	3.82	2.47	2.47	3.47
" " IV	4.08	5.52	4.08	7.38
" " V	6.08	5.23	4.33	8.12
<i>Teucrium scorodonia</i>				
	4 leaves developed	6 leaves developed	12 leaves developed	
Developed and tested at ill. II	2.69	4.82	7.30	—
" " III	6.13	7.00	7.13	—
" " IV	6.01	6.12	7.32	—
" " V	6.90	6.07	7.45	—

From the second stage onward the *Pisum sativum* results may be divided into 2 groups: one consisting of classes IV and V where the plant, making use of the slight degree of adaptation it possessed, was able to make up for the reduction of light at the lesser illumination by modifications in its structure and chlorophyll content, and the other consisting of classes II and III where the assimilating energy is definitely lower and proportional to the available light. *Teucrium scorodonia*, on the other hand, shows throughout its development a very great adaptability to shade though the high assimilating energy of plants in class II is not developed till the 3<sup>rd</sup> stage.

4) *Assimilating Energy of plants developed under different degrees of light intensity when exposed to direct sunlight.*

Stage in the dev. of the plant	Cc of CO <sup>2</sup> absorbed by 1 gm. of green leaf in 1 hour at ill. I			
	1st 2 leaves developed	2nd 4 leaves developed	3rd flowering	4th fruiting
<i>Pisum sativum</i>				
Plant dev. at ill. II . . .	3.74	1.26	1.17	2.98
" III . . .	4.53	1.45	6.65	4.82
" IV . . .	5.25	3.69	5.36	7.43
" V . . .	6.08	5.23	4.62	8.12
<i>Teucrium scorodonia</i>				
	4 leaves dev.	6 leaves dev.	12 leaves dev.	
Plant dev. at ill. II . . .	4.23	4.51	7.11	—
" III . . .	7.21	8.00	9.24	—
" IV . . .	6.06	6.09	9.58	—
" V . . .	6.90	6.07	7.45	—

Considering first *Pisum sativum*, here again as in the previous table. the classes IV and V ran fairly well together, class III presented considerable fluctuations according to its stage of development, and in the flowering stage actually had a higher assimilating energy than the group IV-V. In class II the assimilating energy was always low. Turning to *Teucrium scorodonia*, the outstanding feature of the table was the high assimilating power of class III which surpasses that of the group IV-V in each stage, while the assimilating energy of class II was also comparatively high especially in the last stage. Thus the conclusion may be drawn that a leaf developed in shade can exhibit a higher assimilating energy in direct sunlight than a leaf developed in sunlight and the writer attributes this to the increased chlorophyll content.

#### 5) Complementary Experiments:

*Assimilating Energy of plants developed under different degrees of light intensity when exposed to a low illumination.*

Plant developed at ill. I tested at ill. I	CO <sub>2</sub> gram-hour
" " " V " " " " . . . . .	2.27
" " " II " " " " . . . . .	1.04
" " " V " " " " . . . . .	2.48
" " " III " " " " . . . . .	0.73
" " " V " " " " . . . . .	7.13
" " " V " " " " . . . . .	5.92

The experiments were carried out with adult plants of *Teucrium scorodonia* and showed that plants developed in full light were at a great disadvantage when transferred to shade compared to those developed in the shade, or in other words emphasised the adaptive modifications which the shaded plants had undergone.

The results given under the headings 3) and 4), though not absolutely comparable, would suggest that plants developed in low light intensities increase their assimilating energy when transferred to sunlight, and a last set of experiments was planned to see whether the supposition held good in the extreme case where leaves of a plant developed in illumination I were tested simultaneously at illuminations I and V:

					CO <sub>2</sub> gram-hour
Plant developed at I and tested at I					1.99
" " " " " V					1.11
" " " V " " V					6.00
" " " V " " I					1.04

The results show that when the light intensity is reduced to  $\frac{1}{9}$ , the assimilating energy is very low — i.e.  $\frac{1}{9}$  of that of the plant developed and tested in sunlight — but the adaptation has been carried to such a point that the leaf is unable to profit by the increased illumination when placed in direct sunlight, yet it is more active in illumination I than a leaf developed in illumination V. An analogous effect is obtained when young plants are transferred to increased light intensity and it is probably due partly to lack of protective tissues and partly to deeper causes depending on the activity of the protoplasm itself.

In conclusion the general results show that plants have the power of modifying their structure and chlorophyll content within their individual limits of adaptability, so that, under natural conditions, their assimilating power tends to remain constant through the different light intensities.

423 - On the Penetration of Different Forms of Nitrogen in Plants: Adsorption Phenomena, Influence of the Nutritive Medium. - CHOUCIAK, D. in *Comptes Rendus de l'Académie des Sciences*, Vol. 159, Nos. 22 and 23, pp. 1606-1609 and 1784-1787. Paris, June 2 and 9, 1913.

The writer shewed in his previous work (1) that the absorption of nitrogen by plants was dependent on the concentration of the solution in contact with their roots, and he then proceeded to extend his investigations by studying the effect of using different compounds of nitrogen. In the course of the experiments it was noticed that the roots of some young plants which had been killed by contact with magnesium sulphate had not lost their power of absorption; the following trials were therefore planned to embrace both live and dead roots.

125 wheat seedlings 3 to 4 weeks old were selected and their roots were removed; these were carefully washed in distilled water and plunged into 100 c. c. of various solutions containing known quantities of nitrogen. Others which had been killed by immersion for half an hour in boiling water were similarly treated. The equilibrium of the solutions was immediately disturbed, and after 10 minutes the roots were removed and the solutions were analysed. The results are given below:

Solutions	NH <sub>4</sub> Cl.		Na NO <sub>3</sub>		Glycocol		Tyrosin	Hydroxyl-amine Chloride
Nitrogen originally present in the solution: mgm . . . . .	0.5	1.0	0.5	1.0	0.5	1.0	0.5	0.5
Nitrogen { by living roots: mgm .	0.091	0.182	0.053	0.105	0.042	0.075	—	—
absorbed { " dead " " "	0.10	0.20	0.055	0.108	0.075	0.153	0.146	0.043
Nitrogen per kilo of dead roots . .	11.7	23.4	6.45	12.7	8.8	18.0	17.2	5.1
Nitrogen per litre of the solution at the end of the experiment with dead roots . . . . .	4.38	8.76	4.8	9.7	4.6	9.2	3.9	5.0
Coefficient of } $\frac{\text{Concentration in root}}{\text{Concentration in sol.}}$ distribution	2.68	2.68	1.34	1.32	1.92	1.95	4.35	1.02

The amount of nitrogen absorbed varies considerably with the nature of the compound in which it is present, and while both live and dead roots absorb approximately equal quantities of nitrogen when presented under the form of ammonium chloride and sodium nitrate, the dead roots absorb a larger quantity when it is presented under the form of glycocol. Further, when the writer compared the amount of nitrogen per unit weight in the dead roots and in the liquid which surrounded them at the end of the experiment, he found that the roots were richer in every case, the ratio or coefficient of distribution rising to over 4 in the case of tyrosin. From this he concluded that the nitrogen must have been *adsorbed* by substances contained in the roots. When the roots were transferred to distilled water, the adsorbed nitrogen was gradually lost, but whereas the power to fix a fresh quantity seemed unaffected when the roots were replaced in ammonium chloride or sodium nitrate, it was greatly diminished when they were replaced in glycocol and tyrosin. Again, by treating the roots with boiling alcohol the adsorbing power was attenuated with regard to ammonium chloride but unaffected with regard to sodium nitrate. In this latter case, however, the power was restored by macerating the roots in an alcoholic extract of fresh roots, showing that the adsorbing substance, though insoluble in boiling water, must have been dissolved by the alcohol.

For a particular compound the adsorption was proportional to the concentration of the solution in contact with the roots, as shown by the following figures:

Initial concentration, in mgm. per litre	5	25	50	100	200	250
Nitrogen adsorbed, mgm. . . . .	0.071	0.36	0.74	1.48	2.5	2.75

When these were plotted they formed a curve strictly analogous to that obtained when dealing with the absorption phenomena of live roots.

In the next set of experiments the effect of adding various salts to the nutritive fluid was studied. The dead roots of 75 plants were immersed for 10 minutes in solutions containing 5 mgm. per litre of nitrogen in the form of ammonium chloride and 0.4 gm. per litre of each of the salts given below. The live roots of 145 plants were immersed for 70 minutes in solutions containing 0.25 mgm. of nitrogen per litre and 1 gm. per litre of the various salts:

	NH <sub>4</sub> Cl	NH <sub>4</sub> Cl + Mg SO <sub>4</sub>	NH <sub>4</sub> Cl + Na <sub>2</sub> SO <sub>4</sub>	NH <sub>4</sub> Cl + Mg Cl <sub>2</sub>	NH <sub>4</sub> Cl + Ca Cl <sub>2</sub>	NH <sub>4</sub> Cl + Ca SO <sub>4</sub>	NH <sub>4</sub> Cl + Na <sub>2</sub> CO <sub>3</sub>	NH <sub>4</sub> Cl + Na Cl
N adsorbed by dead roots . . . . .	100 (0.06 mg.)	0	7.5	23.2	31.5	37.0	42.0	82.0
N absorbed by live roots . . . . .	100 (0.127 mg.)	8.2	28.0	32.0	48.0	55.0	--	64.5

In the case of the live roots it was observed that if the solution were shaken the rate of absorption became constant after 10 to 15 minutes, while in the case of the dead roots some preliminary trials showed that the equilibrium of the solution was not disturbed immediately, as when ammonium chloride alone was used, but only after a period of time which varied with the nature and concentration of the added salt.

The salts affect both absorption and adsorption, and the figures, though different, run in the same order for the two classes of phenomena, which must be intimately connected with one another. Analogous results were obtained with sodium nitrate, but in this case magnesium sulphate and sodium chloride accelerated instead of retarding the absorption and adsorption processes. Where two or more salts were used simultaneously they seemed to neutralize one another's effect to a certain extent, as shewn by the following adsorption experiments.

Solution containing per litre			Nitrogen adsorbed in mgm.
10 mgm. $\text{NH}_4\text{Cl}$	+ 300 mgm. $\text{Na}_2\text{SO}_4$	.	100
"	"	+ 40 mgm. $\text{NaCl}$	104
"	"	+ 80 mgm. "	123
"	"	+ 120 mgm. "	111
10 mgm. $\text{NH}_4\text{Cl}$	+ 200 mgm. $\text{Na}_2\text{SO}_4$	.	100
"	"	+ 40 mgm. $\text{MgSO}_4$	111
"	"	+ 80 mgm. "	120
10 mgm. $\text{NH}_4\text{Cl}$	+ 400 mgm. $\text{Na}_2\text{SO}_4$	.	100
"	"	+ 40 mgm. $\text{CaSO}_4$	127
"	"	+ 80 mgm. "	115
"	"	+ 120 mgm. "	110

With live roots similar absorption results were obtained and the increased nitrogen fixed by the plant under these conditions may account in part for the beneficial effect often produced by dressings of sea salt, gypsum or manganese sulphate.

The writer summarises his conclusions as follows: when roots are put into a nitrogenous solution, the nitrogenous substance is distributed between the water and the superficial layers of the root in certain proportions (coefficient of distribution), which are readily modified in either direction by changes in the external medium, such as the addition of salts to the water. Once a state of equilibrium has been established, the rate of diffusion in the root then becomes proportional to the difference of concentration between the superficial and the deeper layers of the root.

924 - The Occurrence of Barium in Tobacco and Other Plants. -- MC HARGUE, T. S. (Chemical Division of the Kentucky Agric. Exp. Station, Lexington, Ky) in *Journal of the American Chemical Society*, Vol. XXXV, No. 6, pp. 526-834, Easton, Pa, June 1913.

A number of barium determinations were made on 17 samples drawn from various parts of the tobacco plant and 24 samples of various parts of other plants as well as on 4 samples of mineral matter (limestone, coal, and soil).

From the results he obtained as well as from those obtained by previous investigators the writer concludes:

1). That barium in small amounts is widely disseminated through rocks, soils and plants.

2) That in tobacco a plant whose barium content has not been previously reported upon, the barium varies from the normal content of other plants, both wild and cultivated (0.009 per cent. as barium sulphate in the stalk of the dry plant) to approximately twice (0.074 per cent. as barium sulphate in the leaf of the dry plant) the maximum reported (0.43 per cent) in "loco weed" (*Astragalus mollissimus* Torr., *Astragalus* sp. and *Oxytropis Lambertii* Push) whose toxic effect on cattle is attributed by some authors to its barium content.

3) That some of the barium occurring in tobacco can be extracted by distilled water and is probably in combination with organic acids.

4) That the occurrence of barium in the live cells of the higher plants suggests that possibly this metal may function in metabolism.

925 - **Chemical Researches on Cacao Seeds.** -- REUTTER L. in *Comptes Rendus de l'Académie des Sciences*, Vol. 150, No. 24, pp. 1842-1844 Paris, June 16, 1913.

The writer has isolated from cacao seeds a white substance formed of microscopic rectangular crystals, soluble in water and to which he has given the name of Cacaorina. This substance which is obtained by the spontaneous crystallization of an alcoholic extract of the seeds treated with hot dilute methyl alcohol, can be decomposed by hydrolysis into theobromine and Cacao Red, and the latter substance, when treated with water slightly acidified by the addition of sulphuric acid, dissolves in its turn and gives rise to a dexter-rotatory sugar, and a new substance named by the writer, Cacao Brown on account of its colour.

Cacao seeds therefore contain cacaorina, (which, on decomposing, forms theobromine) glucose, cacao red and cacao brown.

926 - **An Unfixable Dwarf Race of Wheat.** -- DE VILMORIN, P. in *Journal of Genetics*, Vol. 3, No. 1, pp. 67-70. Cambridge, June 1913.

PLANT  
BREEDING

"Shirao" wheat originated in 1886 from a cross, and has been cultivated ever since at Verrières proving itself a perfectly fixed and stable white variety. In 1902 a dwarf plant was noticed in the population and its descent was carefully studied. Seed was annually saved from dwarf plants, but a pure dwarf race has never been isolated, the progeny of such plants consisting always of a mixture of tall and dwarf plants in the proportion of 1 tall to 2 to 3 dwarf. A dwarf red Shirao was obtained as the result of an accidental cross with a red variety and though the colour character became fixed the size character behaved exactly as it did in the white strain. A third example of an unfixable dwarf race was provided by a Beseler's Brown Club Head which produced a dwarf in 1905. In all three cases tall plants issuing from dwarf plants have never produced anything but tall descendants.

The phenomenon is somewhat analogous to that of inheritance in yellow mice recently studied by Miss Durham (1) and the evidence points to its being a case where the gametes bearing the dominant character may unite but never develop into a new individual, for if there were repulsion between the gametes, with an unlimited supply of pollen, the proportion of dwarf to tall should be 3 to 1 whereas it is nearer 2 to 1. The writer counted the number of grains on the respective ears and found that while the tall ears averaged 59, the dwarf only averaged 50, but no differences between tall and short were observed, either in germination power or in vigour of the plant, indicating that if the theory of a non-viable pure dominant were cor-

(1) F. M. DURHAM. Further Experiments on the Inheritance of Coat Colour in Mice *Journal of Genetics*, Vol. 1, No. 2, pp. 166. Cambridge, 1911.

rect the death must occur before the seed stage was reached. The non development of the pure dominants would also account for the ration dwarf to tall being always above 2, for where one grain fails in a spikelet, its place is frequently taken by another from the centre of the spikelet which would otherwise remain sterile.

927 - **Preliminary Report on Effect of Close and Broad Breeding on Productiveness in Maize.** MONTGOMERY, E. G. in *Twenty-fifth Annual Report on the Nebraska Agricultural Experiment Station*, pp. 181-192. Lincoln, Nebraska, 1912.

Self fertilization being injurious to maize, the question arises as to whether it is advisable to use a single ear as a foundation stock or whether a number of ears should be crossed in order to maintain the yield. A series of experiments to test the point were begun at the Nebraska Experiment Station in 1909, and the results of the first three years' work, are given in this preliminary report.

The plants are grown under the following conditions :

I. Selfed.

II. Each ear is fertilized by the pollen from 10 to 15 sister plants, but the strain is carried on from year to year by the progeny of one single ear.

III. As II, but the strain is carried on from year to year by sowing a composite sample from 10-15 ears..

IV The plants are detasseled to ensure cross fertilization from another strain ; but as only four strains were originally used in the experiment, these have now lost their identity and the experiment has become a test of detasseled plants.

V. Six ears are selected annually from the best of six rows, and sown the following season, one ear to a row.

VI. Seed is secured each year from a corn crop grown under ordinary field conditions — that is to say that the farmer who produces it was originally provided with pedigree corn and has since saved the best ears of his crop each year for sowing the following season.

The yields obtained in 1911 are given below :

I.	.....	9 90 bushels (of 56 lbs) per acre
II.	.....	37 66 " " " "
III.	.....	41 30 " " " "
IV.	.....	45 89 " " " "
V.	.....	44 02 " " " "
VI.	.....	40 70 " " " "

The results show that all degrees of close breeding between nearly related strains are injurious, for the classes II, III, and IV are beginning to exhibit signs of lack of vigour, which will become more pronounced every year. As a results of selfing, Class I has already produced several distinct types, which are apparently perfectly pure.

928 — **Selection of Maize on the Estate of Ruma in Hungary.** — FLEISCHMANN, RESZO in *Köszlesek*, Year 23, No. 47, pp. 1694-1697. Budapest, June 21, 1913.

Since 1909 the estate of Ruma (Szerem county) has been occupied with the improvement of field crops by rational selection. The first work was with wheat; maize was taken up later. The variety used was Horsetooth, which has been grown on the estate for a good time, and already, when the work was begun, showed a number of types, differing both in botanical characters and in time of ripening.

The selection system is divided into two parts:

1) Preliminary examination, in which the descendants of the selected plants are submitted to botanical analysis.

2) True selection, consisting in rigorous genealogical selection of the plants approved at the preliminary examination, and their gradual improvement.

For the first part of the selection, a large number of plants showing the desired characters are selected on the field when ripe in autumn. These plants are brought to the laboratory for botanical examination, and those not approved are discarded; the remainder are registered. All the following points are considered, both for the parent plants and for their descendants:

**Whole plant:** height; amount and uniformity of unit yield; precocity; depth of the grain cavity in the ear; rapidity of growth; small number of sterile shoots.

**Ear:** rows straight and close, with at least 14 grains in each; cylindrical form of the ear; proportion of rachis to whole ear — should be less than 14 per cent.

**Grains:** colour and evenness; 100-grain weight (over 30 gms., and should weigh over 56 lbs. per Imp. bushel); power of germination (should be over 96 per cent).

After this examination, the grains of the parent plants are sown separately in the trial garden for examination of their offspring. The treatment of the garden soil is similar to that given under field conditions, so that the plants undergoing selection may be treated like those from the fields. Only half the grains from each ear are sown (besides which the ones at each end are discarded), the other half being left in the cob till the following year in tin boxes.

The arrangement of the plots is shown on page 1217. It will be seen that the grains of each selected ear are sown on three different plots; the number of plants is the same for each. These parallel sowings make the control of the daughter-plants more exact, and show the influence of irregularities of soil. The results (taking the average of the three plots) obtained by the examination of the first generation give the first indications as to which of the daughter plants are worth selection. The best of these are then submitted to true selection.

After the first year, all the descendants of the élite types are available and the most perfect of them are chosen to be fresh parents, and the

grains are stored in a tin box ; all this forms the material for the second part of the process.

The stored grains are sown separately on the same plan ; but the weakest are eliminated beforehand on the previous year's results, so that the influence of their pollen on neighbouring ears may be avoided. The multiplication of the élite plants is carried on at the same time on other plots, till they are ready for field cultivation.

If an élite strain is approved by several years' trial, and found free from all faults, it is then submitted to further genealogical selection, with a view to fixing its qualities ; for this process, its grain is sown again separately, and once more the best descendants are selected.

From this process the following observations may be drawn :

1) By choice of different types and genealogical selection, élites may be created whose yields differ considerably, and which transmit their characters to their offspring.

2) The different descendants of one parent plant are not of equal value, owing to cross-fertilization. Examples are given by the figures for the élite types 122-1 and 122-2, and those for their parent, obtained in the preliminary selection of 1911 and the first generation following (see Table II).

3) From this practical selection the following conclusion may be drawn : as the innate qualities of an ear undergoing selection cannot be recognized for certain, its improvement is not yet fixed in the selected ears of the first generation. Artificial crossing must therefore be used ; that is to say, the offspring must be controlled for several successive generations, so that the subsequent selection may be carried out on the most nearly analogous individuals, and the superior qualities of the types recognized as best may be fixed.

This method is illustrated clearly by the genealogical tree of the élite type 122, which was constantly better than the other types chosen. The following is the explanation of the signs used :

||| = ear of élite whose grain was divided ;

Δ = first filial generation, occupying three rows in the trial garden ;

∩ = second filial generation, occupying rather over  $\frac{1}{4}$  acre ( $\frac{3}{4}$  arp.) in the plot garden ;

└─ = third filial generation, occupying 25 to 50 acres in the field,

This genealogical tree and the tables give a good idea of the system of selection followed at Ruma. Experience has shown that the cross-fertilization between the élite types sown near together does not make any appreciable difficulty if they are grouped carefully, keeping apart those with contrasting characters.

TABLE I. — Arrangement of the rows of a 1st generation group.

(Distance apart of the plants:  $28\frac{1}{2}$  by  $16\frac{1}{2}$  inches).

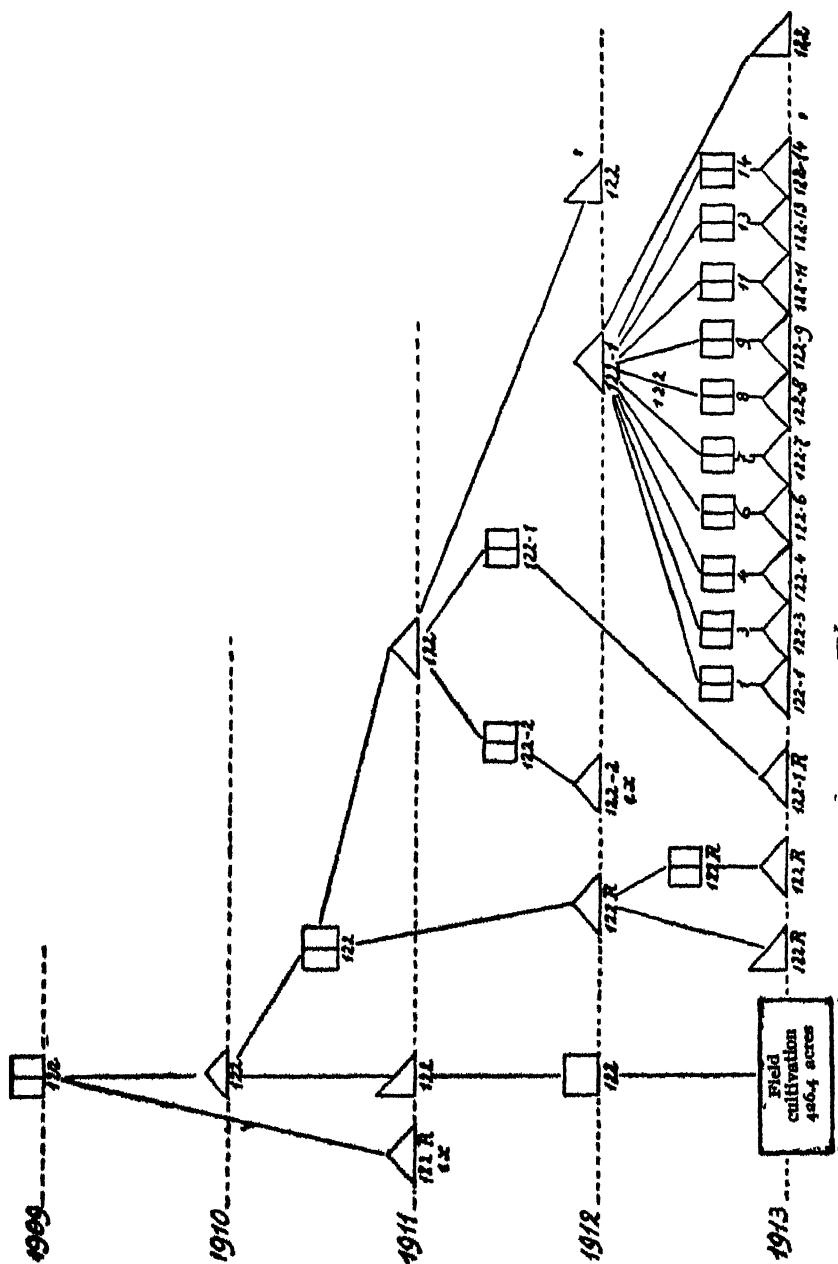
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Nos	Path.
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TABLE II. — *Average annual yields.*

Year	No.	Stage of multiplication	Cultivation		Average yields.						Difference of No. 122 in % of average of the group		Remarks
					of the group		of No. 122						
			Place	Area	per plant: gm.	per acre: lbs.	per plant: gm.	per acre: lbs.	per plant: gm.	per acre: lbs.	+	—	
1909	122	□	—	—	179	—	—	190	—	6.1	—	First parent plant	
1910	122	△	trial garden	3 rows	208	—	—	249	—	19.7	—	Parent plant.	
1910	122	□	—	—	242	—	—	288	—	19	—		
1911	R 122	△	trial garden	3 rows	121	—	—	138	—	14	—	Further trial stopped owing to proportion of rachis to ear (16.7 %) being too large.	
1911	122	△	trial garden	3 rows	121	—	—	125	—	3.3	—		
1911	122	△	plots garden I.	—	—	3690	—	—	3880	5.4	—		
1911	122-1	□	—	—	195	—	—	226	—	15.8	—		
1911	122-2	□	—	—	195	—	—	178	—	—	8.7		
1912	122-1	△	trial garden	3 rows	194	—	—	213	—	9.7	—	Discarded.	
1912	122-2	△	"	"	194	—	—	170	—	—	12.3		
1912	R. 122	△	"	"	194	—	—	209	—	7.7	—		
1912	122	△	plots garden II	—	—	5250	—	—	5820	10.8	—		
1912	122	□	field	—	—	4330	—	—	5030	16.0	—		

*Pedigree of elite type No. 122*



- 929 - **The Inheritance of Certain Forms of Chlorophyll Reduction in Corn (Maize) Leaves.** EMERSON, R. A. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 89-105. Lincoln, Nebraska, 1912.

The writer gives an account of his experiments on variegated maize plants. He found seven different kinds of chlorophyll reduction, graduating from a complete lack of chlorophyll, and apparently also of plastids, to an inconspicuous white streak on the leaves. The knowledge of the interaction of the various forms is still very incomplete. Where the different types have been carefully studied, they have been shown to be Mendelian recessives to normal colouring.

- 930 - **The Inheritance of the Ligule and Auricles of Corn (Maize) Leaves** EMERSON, R. A. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 81-88, Lincoln, Nebraska, 1912.

A family of maize lacking both ligules and auricles was first noticed by the writer in 1910, when 17 descendants of a self-pollinated plant grown the previous year exhibited the peculiarity. The general circumstances indicated that the two characteristics constituted together a single Mendelian factor, which was recessive, and subsequent breeding experiments entirely confirmed the hypothesis. The inside of the sheaths of the liguleless maize were more frequently discoloured as from incipient decay, than normal leaves, which may possibly indicate a useful function of the ligule

- 931 - **Influence of 'Pickling' on the Germination of Cereals (1)** JOHNSON J. C. in *Journal of the Board of Agriculture*, Vol. XXII, No. 2, pp. 120-124. London, May 1913.

A series of experiments was carried out at University College, Cork, using formaldehyde and copper sulphate solutions of different strengths, and varying too the period of immersion of the seeds. The germination was carried out in clean sand and no trouble was experienced with moulds or parasites of any sort. Some seeds were washed after immersion, while others were not, but this treatment apparently caused no appreciable effect.

Wheat steeped for 15 minutes in a 0.25 per cent solution of formaldehyde germinated 80 per cent. and gave the same result when steeped for 5 minutes in a 2 per cent copper sulphate solution. Barley and oats were still more resistant, but the writer recommends in practice 0.125 per cent formaldehyde solution for 15 minutes and 0.5 per cent copper sulphate solution for 12 hours for general use or 1 per cent solution for 6 hours for barley and oats. On comparing the two series of experiments, it was seen that copper sulphate retarded germination about twice as much as formaldehyde.

- 932 - **Quality of Sugar-Beet Seed.** — URBAN, J. (Experiment Station for the Sugar Industry at Prague). *Zeitschrift für Zuckerindustrie in Böhmen*. Year XXXVIII, Part. 3, pp. 444-448. Prague, June 1913.

As a result of trials made in 1911 and 1912, the writer concludes, in agreement with previous experiments, that beet seeds preserve the same quality for several years; consequently a beet seed whose hereditary character is to give rich beets will show this property in any year and in any soil.

(1) See also No. 797, B. July 1913,

(Ed.).

933 - Notes on Pollination and Cross-Fertilization in the Common Rice Plant. HECTOR, G. P. in *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. VI, No. 1, pp. 1-10, Calcutta, June 1913.

A number of the varieties of rice cultivated in the districts of Lower Bengal have been grown on the Dacca farm during the last two years, with the object of studying their character in single plant cultures, and of ascertaining to what extent, if any, natural cross fertilization takes place. References are given to previous work on the subject together with the chief conclusions drawn by other investigators. The single-plant cultures of cross-fertilized plants provided material for studying the inheritance of certain characters. The writer summarizes his conclusions as follows:

"1) In Lower Bengal, under favourable conditions, cross-fertilization may take place in rice to an extent which may be provisionally estimated at about 4 per cent." (This confirms the most recent work of Fruwirth and van der Stock).

"2) This cross-fertilization takes place wholly through the agency of wind and would seem to be effective only between flowers of adjacent plants to a radius of a few feet.

"3) As regards certain characters at least, e. g. grain colour, segregation along Mendelian lines appears to take place.

"4) So long as seed of a variety is kept free from accidental mixture, there is no risk of contamination from cross-fertilization, but if seed gets mixed, cross-fertilization will undoubtedly take place between adjacent plants in a plot, and to an extent sufficient in a few years' time to reduce a variety to a number of splitting types. Hence the imperative necessity of taking every precaution to keep seed of varieties free from accidental mixtures."

934 - The Cultivation of Rice with the Help of Machines (1). — F. MAIN in *Journal d'Agriculture Tropicale*, Year 13, No. 143, pp. 129-133. Paris, May 31, 1913.

The writer deals with the experiments carried out in 1912-1913 and superintended by Mr. Alazard, engineer to the Indo-Chinese Rice Growing Association. The results of these trials were as follows:

The small hand-sower proved satisfactory in spite of the inexperience of the native labourers; 0.6 of an acre can be sown in one day, and the rice is distributed in small holes in rows 12 to 16 in. apart and 14 in. apart in the rows. As soon as the grain was up, a marked difference was noted between the parts of the field where the seed had been sown and those where it had been transplanted in the usual native manner. The necessity for sowing on clean land became evident as hoeing was a difficult process on the submerged soil. But whereas the sown rice did not suffer from a sudden rise of the water the transplanting operations had to be interrupted. The sown crop came into ear earlier and gave every promise of an excellent yield.

The crop was harvested in two different ways in order to compare the results obtained by transplanting and direct sowing:

(1) See No. 1612 B. Dec. 1912, and No. 121 B. February 1913.

(Ed.)

1) A reaper and binder was used to collect the crop sown or transplanted on to 1 hect. (2.47 acres) of ploughed land.

2) The crop, sown or transplanted on to 1 hect. of unploughed land, was harvested by hand.

The reaper acted as well as the circumstances permitted and Mr Alazard deduced the following conclusions from the experiment: Rice selection should be practised in order to obtain a variety with rigid straw which will not lodge easily, and a grain which will ripen more uniformly.

3) Mechanical harvesting is a very easy operation. A binder works well, provided its pace is sufficiently rapid. In the Thai Lai ricefield, where the experiments were made, the soil was dry enough to allow of the passage of a four ton tractor. The following are the results of the harvest:

Rice sown on ploughed land . . . . .	1 tons	16 $\frac{1}{2}$ cwt/s per acre
Rice transplanted on ploughed land . . .	1 "	3 $\frac{1}{2}$ " "
Rice sown on unploughed land . . . . .	1 "	4 $\frac{1}{2}$ " "
Rice transplanted on unploughed land . .	0 "	15 " "

The above figures show that mechanical cultivation of rice fields already yields positive results, and it will now be necessary to give the soil a better preparation for the crop and to arrange a system of irrigation which will facilitate hoeing operations.

935 - **Manuring of Broom Corn.** — 1. PETRINI I., *La coltivazione della saggina da granata nell'agro Fiorentino Pratese*, 67 pp. + 9 figs. Prato 1913. — 2. CARRÉ, A. La culture du sorgho à balais dans le Sud-Ouest de la France. *La Vie Agricole et Rurale*, Year 2, No. 20, pp. 567-570. Paris, April 19, 1913.

The cultivation of broom corn (*Sorghum vulgare* Pers., var.) is becoming increasingly important. This crop is grown particularly in Northern and Central Italy, the South West of France, Turkey, Austria-Hungary and latterly Tunis (1).

The question of the manuring of broom corn is of special importance, but has not yet been sufficiently studied. Broom corn is a gross feeder, and its period of growth is generally short; it therefore needs a large amount of nutritive material, particularly phosphoric acid and potash, in a rapidly assimilable form. According to Prof. Pusserini, a crop of 44 bushels of grain and 56 cwt. of straw of common sorghum would take out of an acre of land:

Nitrogen . . . . .	46.7 lb.
P <sub>2</sub> O <sub>5</sub> . . . . .	63.2 "
Potash . . . . .	81.4 "

Sig. Petrini undertook experiments on broom corn, particularly as to manuring, on a Royal property in the commune of Prato.

The plan and results of the experiments are shown in Table I.

(1) In recent years this crop has also been taken up in North America and Australia. — See *The Broom Corn Review*, Wichita, Kansas; also G. MARKS: Broom Millet, *Dept. of Agric., New South Wales, Farmers' Bulletin No 20* (2nd. ed.), August 1911, (Ed.).

TABLE I

Plot	1	2	3	4	5
Area . . . . . sq yds	840	840	840	840	840
Substances left by previous crop of swedes	Nitrogen lbs. 10.1 $P_2O_5$ . . 7.25 Potash . . 8.5	10.1 7.25 8.5	10.1 7.25 8.5	10.1 7.25 8.5	10.1 7.25 8.5
Manuring	Farmyard manure lbs. 3085 Nightsoil . . . 4630 Superphosphate . . — Nitrate . . . . — Sulph. of ammonia . — Sulphate of potash . —	3085 — 92.5 23 — —	3085 — 92.5 — 23 —	3085 — 92.5 23 — 20	3085 — 92.5 — 23 20
Cost of manuring . . . . s-d	16-4	11-9	15-7	16-6	17-0
Straw: weight . . . . . lbs.	9740	8460	9015	8760	8880
Value . . . . . s-d	33-7	35-6	38-9	35-5	36-4
Grain: weight . . . . . lbs.	473	462	461	419	482
Value . . . . . s-d	21-7	21-1	2-11	19-2	22-0
Substances left after the crop	Nitrogen . . lbs. + 56.3 $P_2O_5$ . . . . + 6.75 Potash . . . . + 3.05	+ 15.6 + 17.9 — 4.5	+ 16.8 + 17.0 + 1.95	+ 17.4 + 16.7 + 9.3	+ 15.9 + 12.5 + 2.9

The net gain per acre from the manuring would have been :

	£	s	d
Plot 1 . . . . .	12	16	7
" 2 . . . . .	12	0	5
" 3 . . . . .	11	16	6
" 4 . . . . .	11	4	2
" 5 . . . . .	10	19	2

It should be noted that plots 4 and 5 were under water for some time.

These experiments show the great advantage of giving suitable dressings of artificial manures on top of a good organic manuring. The effect of phosphatic manuring is evident; nitrogen gives better results as ammonia than as nitrate, though nitrate of soda is of great value if the plants are very weakly. The advantage from potash is noticeable but not very large.

As a result of these considerations, the writer recommends for broom corn an abundant manuring, particularly to avoid exhaustion of the soil; the best treatment would be a foundation of farmyard manure with bone superphosphate, sulphate of ammonia and sulphate of potash.

M. Carré has made manuring experiments on land of moderate fertility in the Haute-Garonne. The yields, calculated per acre are given in Table II.

TABLE II.

Plot	Manuring	Grain		Straw		Total value of crop
		bu.	£ s d	cwt.	£ s d	£ s d
1	Unmanured . . . . .	50	5 15 6	8 3/4	5 6 0	11 1 6
2	Farmyard manure, 7 1/2 cub. yds.	68	7 16 9	12	7 4 6	15 1 3
3	As 2, + 450 lbs. superphosphate at 14 to 16 % . . . . .	72	8 7 0	14 1/2	8 13 0	17 0 6
4	As 3, + 135 lbs. nitrate of soda . . . . .	72	8 7 0	14 1/2	8 13 6	17 0 6

That farmyard manure is valuable is shown by these experiments also; nitrate of soda is not necessary except in rainy seasons; phosphatic manure always gives good results to complete the action of farmyard manure; though it may not always increase the weight of the crop, its effect on quality is marked, so that both the grain and the straw fetch higher prices.

In conclusion, it may be stated:

1. *The basis of manuring for broom corn should be dung.*
2. *The necessary element besides is phosphoric acid, which tends specially to improve the quality.*
3. *Mineral nitrogen and potash may be of use in some cases.*

## FIBRE CROPS

936 - *The Development of Cotton Growing in British Possessions. The British Cotton-Growing Association: Eighth Annual Report*, pp. 1-36; and, *Cotton Growing in the Anglo-Egyptian Sudan*, pp. 1-61. Manchester, 1913.

The British Cotton-Growing Association was incorporated for the purpose of developing the cultivation of cotton in the British Possessions. In its 8th Annual Report the Association gives an account of the work done in 1912.

In West Africa, most satisfactory progress is reported from Northern Nigeria (1), and good progress from Lagos, where ultimate success will apparently depend on the introduction of high-yielding varieties, but

the experiments in the Gold Coast have not been promising and are only being continued on a small scale. In British East Africa the experiments in Jubaland are being discontinued, but Uganda shows most encouraging signs of development, and in Nyasaland the advances made to planters by the Association have largely contributed to the success of cotton in that country; the crop there, though liable to damage by unfavourable weather will undoubtedly undergo considerable extension, especially after the opening of the new railway between Blantyre and the Zambesi. In Rhodesia the Association is discontinuing some of its experiments, which will be carried on by the British South Africa Company, though it continues its advances to planters; but no great progress is reported from this country or from South Africa.

It is the Anglo-Egyptian Sudan which holds the great promise of future development in cotton cultivation. In January and February 1912 a deputation from the Association visited the Sudan and subsequently presented a report to the Council on the possibilities of cotton growing in that country, the main conclusions of which are in complete accord with those of Mr. Arno Schmidt in his report presented to the International Federation of Master Cotton Spinners' and Manufacturers' Associations (1).

The result of the British Cotton-Growing Association's work has been to show where the chief developments in cotton growing may be expected and its efforts in future will be concentrated on those districts which have shown themselves best adapted to the crop.

937 - **Cotton-Growing Experiments in Sicily in 1912.** BARZI, A. in *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year, XII, Series C., Parts 2-3-4, pp. 45-50. Rome. February, March, April 1913.

The writer draws attention to the fact that, owing to the injury caused to the bean crops by *Orobancha speciosa*, it is advisable to grow cotton in the place of these legumes, and he enumerates the advantages to be obtained by reintroducing the crop in Sicily. He points out that cotton, cultivated as a summer crop is of great importance in the rotation, for it does not exhaust the land and necessitates repeated hoeings which prepares the soil for wheat. Further, though cotton does not increase the stock of nitrogen in the soil like beans, it scarcely removes any of this compound; moreover it should not be forgotten that cotton cakes form an excellent cattle feed and might be substituted for summer forage which is very scarce in Sicily.

The fertilizing experiments described by the writer were carried out on land belonging to the Colonial Gardens for the purpose of determining the effect of different manures. This land is well adapted to such experiments, as the soil, both in its mechanical and chemical composition, is typical of Sicilian soils suitable for cotton growing.

The conclusions drawn are as follows:

*Nitrogenous manures*, considerably increase vegetative growth, but cause the crop to ripen later. They are to be recommended in the case of

poor soils, hot climates, and very early varieties of cotton which exhibit more lateral development than growth in height. The soils of Sicily are nowhere poor enough to necessitate the use of nitrogenous manures especially as the latter have a bad effect upon the technical qualities of the lint.

*Phosphatic and potassic fertilizers* cause the crop to ripen earlier and increase the weight of the lint. Their influence on vegetative growth, is negligible compared to that of nitrogenous fertilizers. The crop being riper is more easily harvested, and the manures also raise the quality of the lint. Phosphatic compounds are only efficacious if they are applied before the rainy season.

*Effect of the different fertilizers upon the technical quality of the lint.*

The following table shows that early maturity and high yield are connected with the quality of the lint. Many factors influence these three coefficients, upon which the success of cotton-growing depends, viz: the nature of the soil and climate, the distribution of the rainfall, light intensity, choice of varieties, fertilisers and the time of topping. The improvement of acclimatized varieties and the acclimatization of better varieties depend on all these factors which are, to a certain degree, capable of modification.

The results of the experiments in question only refer to one of these factors; but they allow of rules being drawn up as to the choice of fertilizers.

*The effect of the different fertilizers upon the technical qualities of the lint.*

Variety	length in mm.			Homogeneity	Colour	Resistance
	Nitrogen	Phosph. Acid	Potash			
Sea Island . . . . .	33	35	35	good	white	good
Upland 2 . . . . .	24	24	24	"	"	"
Sea Island Biancavilla . . . .	24	25	24	bad	"	"
Mississippi . . . . .	28	29	28	"	"	"
Biancavilla Caravonica . . . .	22	26	23	"	"	"
Erythrean . . . . .	24	24	24	fair	"	"
Biancavilla Mit-Affi . . . . .	28	29	28	bad	dirty white	"
Simpkin's Early Prolific . . . .	18	21	21	fair	white	"
Hastrove . . . . .	23	24	24	"	whitish	average
Horahled King's . . . . .	18	20	20	bad	white	"
Mit-Affi . . . . .	25	26	25	good	yellowish-brown	good
Caravonica Wool . . . . .	36	38	37	fair	white	excellent
Upland No. 12 . . . . .	18	21	21	"	"	good

938 - *Agave Lespinassei* (Zapupe Vincent).—CALVINO M. in *La Hacienda*. Vol. VIII, Nos. 5-8, pp. 150-153, 182-185; 214-217, 248-250 + figs., Buffalo, N. Y., February-May 2913.

Prof William Trelease, Director of the Botanical Gardens, Saint Louis has classified the agaves producing textile fibres (zapupes) as follows.

1. *Agave Zapupe*, blue agave (zapupe azul) or Estopier agave (zapupe Estopier).

2. *A. Endlichiana* ('ixtle' or 'ixtle manso') which grows wild near Huastuco.

3. *A. aboriginum* (Zapupe silvestre, cimarron, « de Sierra Chontla) which grows wild between Tampico and Vera Cruz and is sometimes cultivated.

4. *A. Deweyana* ('Zapupe de Tantoyuca', 'Zapupe verde' which has a long vegetative period and large leaves, but the latter are brittle so that the variety is not cultivated.

5. *A. Lespinassei* (zapupe Vincent). The natives of the northern part of vera Cruz and of the districts round Tampico and Tamaulipas have utilized the fibre of certain agaves from very remote times, but the plant has only been cultivated since 1900. Mr. Estopier was the first to establish a plantation, and he began with blue agave at Tampico. In 1905, a second plantation was established by Mr. Vincent in the island of Juana Ramirez (about 30 miles from Tampico in the canal between Tampico and Tuxpan). He also used the blue agave, but not exclusively and part of the plantation was stocked with a green agave which grew wild on the Island (Vincent agave). Blue agave had originally been chosen on account of its early maturity and thin fibres, but it subsequently proved to be shorter lived, and its fibre not only deficient in yield but also difficult to extract. The yield of clean fibre was only 2.75 per cent, while most agaves give 3 to 3.5 per cent, "Henequen of Yucatan" (*agave rigida*; syn. *A. sisalana*) 4 to 4.5 per cent, and Vincent agave 5.5 to 6 per cent. As a result Vincent agave is being substituted for the blue variety in the Juana Ramirez plantation.

The following data indicate the agricultural character of the various agaves :

	Age of plant when coming into bearing  Years	Age of plant when flowering  Years	No. of leaves harvested per annum	Fibre per leaf.  oz.
Henequen of Yucatan . . .	6—7	14—15	30	1.4
Blue agave . . . . .	2 ½	4—5	70	0.5
Vincent, Agave . . . . .	3	13—14	80	1.0

And in the next table are given results obtained by Professor Lister H. Dewey (in charge of fibre crops investigations, Bureau of Plant Industry, U.S. Department of Agriculture) working on Vincent agave.

Age of leaves	Mean resistance	Resistance per gramme-metre	Mean yield of fibre per leaf
2 ½ years	1 237,5 gm	26 107,5 gm	11,7 gm (0 4 oz)
3	1 422,0 "	29 329,0 "	15,0 " (0 5 oz)
8-9 "	1 552,5 "	26 159,0 "	34,2 " (1 2 oz)

Vincent agave is propagated: 1) by slips or runners which the parent plants begin to form 11 months after planting out; 2) by means of small bulbs formed on the floral spadix; 3) by seed. The best slips are those 6 to 7 months old and 8 to 12 inches long. Bulbs and seed are first sown in a seed bed, and transplanted after six months in the case of bulbs, and after one year in the case of seedlings. The plant flourishes on sandy marls, but would probably grow well on any soil with good drainage, and will adapt itself to any exposure so long as it is not shaded. It is usually planted in rows 10 feet apart and 3 feet apart in the rows which seems the most suitable spacing, but occasionally the plants are set out on the square 3 or 6 feet apart. By adopting the former method catch crops can be cultivated during the first 10 months and the writer recommends ground nuts (*Arachis hypogaea*) for the purpose. Owing to their sandy nature, the soils on the northern coast of the state of Vera Cruz do not either dry out or crack during the rainless months, otherwise surface cultivations would be required. The sixth year, that is to say after the 3rd harvest, runners are left between the lines, one for each plant, destined to replace the parent plant when the latter has flowered. Cutting should not begin before the central bud and its surrounding leaves have attained their required length, otherwise the subsequent development of the plant is affected. The crop is harvested all the year round, each plant furnishing 2 cuttings, and only those leaves which form an angle greater than 45° with the central bud are removed. At Yucatan it is customary to cut the floral spadix of "herequen" as soon as it attains a length of 18 inches thus obtaining a greater development of the last leaves, and the writer recommends that similar methods should be employed in the case of the Vincent agave.

Not more than 24 hours should elapse between the time of cutting and the beginning of the extraction process, otherwise the leaves are liable to fermentation and rotting.

The gummy fibre issuing from the defibrating mill is washed in hot water tanks heated by steam, and then dried, producing fibres of a reddish

colour which is probably due to iron hydrate from the steam pipe. The fibre may be bleached by washing in cold water with soap (2 to 3 per cent of the damp fibre) and by subsequent rinsing in clean water. For certain purposes, the fibres are merely dried without any previous washing.

The stem and floral bud of old plants are cut at ground level, slit down the middle and baked for 16 hours in stone chambers which are sometimes below the level of the soil. They are then submitted to pressure to extract a juice which, when fermented and distilled, produces a liqueur containing 57 per cent of alcohol and known in the trade under the name of "Mezcal de San Carlos".

The writer gives the following balance sheet for the crop :

<i>Expenses.</i>			
1st. year.	£	s	d
Value of 198 acres (80 hectares) of land at £2.1.3 per acre . .	408	7	6
Clearing and cleaning . . . . .	408	7	6
Buildings . . . . .	820	0	0
Preparation of land for planting . . . . .	246	0	0
Cost of 250 000 plants at £10.5.0 per thousand . . . . .	2 562	10	0
General management . . . . .	512	0	0
Total expenses at the end of the 1st. year. . .	£4 957	5	0
2nd. year.			
Interest on capital involved at 6 per cent . . . . .	297	7	3
General management . . . . .	512	0	9
Total expenses at the end of the 2nd year. . .	£5 766	12	3
3rd year.			
Defibrating apparatus . . . . .	716	15	8
General management . . . . .	512	0	0
Total expenses at the end of the 3rd year. . .	£6 995	7	18
<i>Receipts.</i>			
3rd year.			
760 tons of fibre at £15.5.0 per ton . . . . .	£11 590	0	0

As the estimates are only approximative, the writer did not take into account the receipts from the catch crop or from the sale of slips which are worth £10 6s 8d at the shipping port. The receipts for the 3rd year have been calculated on the basis that each leaf yields 1 oz of fibre, that the pulping machinery works 10 hours a day and that 100000 leaves are defibrated in that time, and that there are 250 working days in the year. The cost of extracting the fibre may be calculated from the following estimates.

	£	s	d
Cutting and transport of 60 000 leaves (allowing 2s. 0d. per 3 000 leaves for cutting by piecework) . . . . .	2	15	0
Defibrating 60 000 leaves (piecework) . . . . .	2	3	6
+ cost of coal . . . . .		6	0
Price of working 60 000 leaves or extracting 3 750 lbs of fibre	£5	5	6
Price per lb. of fibre . . . . .		0.33d	

An equal sum must be allowed for freight, commission etc. The fibre is worth 2.7 d per lb on the New York market, leaving a net profit of 2.1 d per lb. on the cost of extraction (a lower figure has been taken in the above estimates in order to be on the safe side).

Mishaps in cultivation, fungoid and insect pests are not greatly to be feared in agave plantations - amongst the latter *Geodermis mexicana* ("tuza") and *Strataegus Julianus* may be mentioned.

## SUGAR CROPS

939 - Sugar Cane Experiments in British Guiana. — (Agricultural conference, 1912). HARRISON, I. B. and others in *West Indian Bulletin*, Vol. XIII, No 2, pp. 95-177, Barbados, 1912.

An account of sugar cane manuring experiments carried out at the Botanic Gardens in British Guiana during the 21 years 1891-1912.

The experiments were planned to provide information on the following points.

Questions	No. of replies
A. — Is nitrogen requisite in a sugar-cane manure? . .	48
B. — Is nitric nitrogen preferable to ammoniacal nitrogen? 24	
C. — Is phosphoric acid requisite? . . . . .	30
D. — Is potash of any use in this soil? . . . . .	24

The "probable error" due to soil being reduced in the following proportions.

	Single plot Probable error per cent	Probable error per cent on average of results. Questions.			
		A	B	C	D
1st. Crop.	5.4	0.8	1.1	1.0	1.1
2nd. "	7.0	1.0	1.4	1.2	1.4
3rd. "	6.0	0.9	1.2	1.1	1.2
4th. "	10.0	1.4	2.0	1.7	2.0
5th. "	17.8	2.5	3.6	3.1	3.6
6th. "	19.1	2.7	4.0	3.3	4.0

The plots, which numbered 91, were  $\frac{1}{25}$  of an acre in area and divided into two sections. In 1901 another field was divided up into 96 plots of  $\frac{1}{20}$  acre each, and in 1910 yet another was laid out into 144 plots of  $\frac{1}{20}$  acre each. Preliminary experiments had shown that planting in rows 5 feet

× 5 feet apart gave a mean yield of  $34.2 \pm 0.7$  tons per acre while rows 6 feet × 6 feet apart gave a mean yield of  $27.8 \pm 0.6$  per acre; the former spacing was therefore adopted.

*Nitrogenous manuring* The first general result is that nitrogen in the form of sulphate of ammonia, nitrate of soda, nitrate of lime, calcium cyanamide, raw and dissolved guano, and dried blood, exerts a favourable action on the yield of the sugar-cane, and is undoubtedly the manurial constituent which mainly governs the yield of that plant, and this applies to every variety of sugar cane which has been under trial. When nitrogen is applied in dressings not exceeding 40 to 50 lbs per acre there is practically no difference between the effects of ammonium sulphate, dissolved guano, and nitrate of soda in normal years; but as a rule the first is considered preferable. Nitrate of lime, cyanamide, dried blood, and raw guano appear to be inferior to these. In the earlier crops of the experiments the best results were obtained by a mixture of one third nitrate of soda and two thirds sulphate of ammonia; but during the latter years this mixture did not prove more efficacious than did either sulphate of ammonia or nitrate of soda alone. When applied in quantities supplying more than 40 to 50 lbs per acre, dissolved guano and sulphate of ammonia are the best sources of nitrogen for the sugar cane on the alluvial soils of British Guiana, the latter being the more economical. The sugar cane makes more effectual use of the nitrogen supplied by 250 lbs. of sulphate of ammonia and by about 300 lbs. of nitrate of soda per acre, than it does of that supplied by heavier dressings. On the whole, dressings of from 2 to 3 cwt. of sulphate of ammonia per acre appear to be the most certainly profitable applications of nitrogen, although in favourable seasons the use of still higher proportions has proved useful.

*Mean results of manuring with sulphate of ammonia.*

	Series I.	Series II.	Series III.
No. of varieties used . . . . .	27	11	19
	Tons of canes per acre		
No nitrogen . . . . .	17.8	13.4	19.1
Low nitrogen (40 lbs. per acre) . . . . .	23.5	—	—
Normal » (60 » » » ) . . . . .	—	19.8	27.4
High » (80 » » » ) . . . . .	23.1	—	—
» » (90 » » » ) . . . . .	—	23.8	—

*Mean results of manuring with dressings not exceeding 300 lbs.  
of sulphate of ammonia per acre.*

Varieties	Tons of cane for each 10 lbs. of nitrogen applied.
Demerara 419 . . . . .	2.00
Scaly . . . . .	1.87
Demerara 625 . . . . .	1.80
" 71 . . . . .	1.62
" 146 . . . . .	1.62
Barbados 147. . . . .	1.52
" White transparent " . . . . .	1.50
Demerara 118 . . . . .	1.42
" 3956 . . . . .	1.40
" 130 . . . . .	1.23
Demerara 95. . . . .	1.18
" 4399. . . . .	1.17
Bourbon . . . . .	1.15
Demerara 116. . . . .	1.12
" 109. . . . .	0.90
" 208. . . . .	0.82
" 4397 . . . . .	0.78
" 4395 . . . . .	0.86

*Mean results of comparative manurial trials with sulphate  
of ammonia and nitrate of soda.*

No nitrogen . . . . .	100
Nitrate of soda, 1906-1911, after 14 years of sulphate of ammonia . . . . .	$175 \pm 9.0$
Nitrate after 14 years of nitrate of soda . . . . .	$166 \pm 11.0$
Sulphate of ammonia, 1905-1911, after 14 years of nitrate of soda. . . . .	$208 \pm 20.8$
Sulphate after 14 years of sulphate of ammonia. . . . .	$182 \pm 10.0$

*Mean comparative results for different nitrogenous manures 1910-1911,  
in tons of sugar cane per 10 lbs of manurial nitrogen.*

Manure	tons of cane
Sulphate of ammonia . . . . .	$1.91 \pm 0.23$
Nitrate of soda. . . . .	$9.57 \pm 0.24$
Nitrate of lime. . . . .	$0.87 \pm 0.25$
Cyauamide. . . . .	$0.62 \pm 0.21$
Dried blood . . . . .	$0.45 \pm 0.20$

*Note.* — Humidity excessive.

*Effects of phosphatic and potassic manures.* — The application of phosphate of lime to the sugar cane gives somewhat increased yields when used with manurings of nitrogen and potash. The increases are higher when the applications are made to plant canes than when added to ratoons. But the

values of the increases in yields, except perhaps during the first two or three crops after the land has been placed under cultivation, are not remunerative. Superphosphate of lime appears to be the best form of phosphate to apply to long cultivated cane lands which have their subsoil water alkaline. New lands are preferably treated with basic superphosphate, or with basic slag the former of these in our trials having given somewhat the better results ; but basic slag is lower in price and hence more economical to use. Mineral phosphates to give increased yields must be applied to the soil in such heavy dressings that their use is decidedly unprofitable.

The addition of potash when applied either as sulphate of potash or as nitrate, exerted little, if any, effect, the normal weathering of the constituents of the soil setting free for each crop potash in excess of the quantity necessary for the requirements of the plants. This holds good under ordinary conditions of cultivation, where the greater proportion of potash taken up by the plants is directly returned to the soil ; but where the canes and cane tops are removed from the land, as in nurseries, it is probable that partial potash exhaustion will take place in the course of a very few crops.

*Other methods of treatment.* The application of molasses gave no decisive results and those obtained with nitro-bacterine were negative.

The use of lime resulted in largely increased yields during the earlier years of the trials, but whether or not its use results in profitable increases depends on the price of sugar. Its action is principally mechanical in improving the texture of the land and it is a question of much importance whether this effect could not be obtained more profitably by the use of light ploughs or cultivators.

Land fallowed from cane cultivation and allowed to become overgrown with indigenous, largely leguminous, herbage for a period of about 3 years, has shown in comparison with similar land under continued cultivation, with short periods of bare fallow, a marked improvement in its tilth, and in its contents of humus and combined nitrogen.

*The effects of long continued cultivation and application of manures upon the land.* — The soils of heavy clay sugar-cane-lands of British Guiana are, as a rule, slightly to markedly alkaline in reaction, which accounts for the fact that sulphate of ammonia usually gives better results than does nitrate of soda where these manures are applied in heavy dressings, for it enables nitrification to take place very readily in the soil during the existence of favourable meteorological conditions. The alkaline state of the soil replenished by that of the subsoil waters brought up by capillarity during dry seasons enables sulphate of ammonia to be used year after year without injuring the soil by making it sour.

The alkalinity of the soil-waters is increased by cultivation of the land, with its attendant increased plant growth, and by the action of some chemical manures on the soil, so that in the course of long continued cultivation the alkalinity of the capillary water of the soil tends to become excessive, with consequent falling off in the crops. The marked alkalinity and the high content of salts of magnesium and of sodium chloride of the ascending subsoil water act detrimentally on growing crops during dry seasons, and may

be the cause of much of the cessation of active growth, of the wilting, and of the scorching of crops soon after the commencement of and during the dry season. Where the soil contains much organic matter undergoing active oxidation, the soil-water remains saturated with carbonic acid gas, which retains the salts of lime in solution, thus modifying beneficially the toxic action of the magnesium salts and the sodium chloride on the plants.

The long-continued use of nitrate of soda in heavy dressings acts detrimentally on the flocculation of the clay in the heavy clay soils and tends to reduce more or less permanently the productivity of the soil. This effect appears to be due to changes in the layers of soil immediately beneath those to which cultural operations usually extend, and may be remedied by deep and thorough forking of the soil.

The growth of sugar cane without the use of nitrogenous manures is accompanied by marked losses of the combined nitrogen, and of the humus constituents of the soil. Where nitrogenous manures were used, the loss of nitrogen was increased, being somewhat less where nitrate of soda was used than where sulphate of ammonia was applied. The combined nitrogen and the humus constituents which accumulate in the upper layer of the soil during long periods of fallowing suffer great and rapid losses when the soil is put under intensive sugar cane cultivation, and to this loss of readily available nitrogen is due the marked falling off in the yield which is almost invariably noticed when successive crops are taken off from either new or long rested soils. The system followed in British Guiana of manuring with sulphate of ammonia, with or without potash and phosphates, with intervening resting or fallowing from cane cultivation during which the land becomes covered with native herbage, largely leguminous, is one accompanied by conservation and possibly increment of the nitrogen of the humus constituents of the soil.

During the first period of the trials there was an apparent loss of nearly 40 per cent of the phosphoric anhydride of the soil, soluble in 1 per cent citric acid. In the second period, during which greatly improved drainage has been in operation and the tillage has been more perfect, the proportion of phosphoric anhydride soluble in 1 per cent citric acid has increased, and where phosphatic manures have been continuously applied, the proportion of available phosphoric anhydride in the soil has been considerably added to. British Guiana sugar cane soils which contain more than 0.007 per cent of phosphoric anhydride soluble in 1 per cent citric acid solution by 5 hours' continuous shaking, will not as a rule respond to manurings with phosphate, whilst it is doubtful if soils yielding from 0.005 to 0.006 per cent of phosphoric anhydride will benefit by phosphatic manurings; but if the soil yields less than 0.005 per cent, it is advisable to apply heavy dressings of basic slag or lighter ones of superphosphate or of basic superphosphate.

Results prior to 1902 suggested that cultural operations set free potash soluble in 1 per cent citric acid solution to an extent greater than the crop demands, but the results of the second period do not confirm this view and the potash soluble in 1 per cent citric acid is now less than it was

at the inception of the experiments in 1891. The great demands of the sugar cane for potash are met from the reserves in the soil which are not soluble in 1 per cent citric acid. British Guiana soils which yield 0.006 per cent of potash to 1 per cent citric acid can be regarded as containing, under the usual system of cultivation, sufficient available potash for the needs of the sugar cane; if the soil yields from 0.005 to 0.006, it is doubtful if the application of potash salts will result in remunerative returns, but where the yield falls below 0.005 per cent, it is advisable to add potash salts in the manures.

The demands of sugar cane for lime as plant food is low, and if the soil gives up more than 0.006 per cent to 1 per cent citric acid, it will probably yield sufficient plant food for ordinary crops.

The cultivation of sugar cane is accompanied by loss of available lime from the surface soil, so that even if large dressings are applied, it is practically entirely removed in the course of 20 years.

Finally neither improved methods of cultivation, nor liming the land, nor the use of manures, affects the proportion of sugar contained in the sugar cane.

Long continued cultivation tends to ameliorate the texture of heavy clay land; the judicious use of natural and artificial manures increases this effect, the upper layers of the soil tending to become more friable, but this result is frequently offset by the great reduction of humus matters present in the soil.

940 - **Sugar Beet in the Argentine.** — DE MARNEFFE, G. in *Journal d'Agriculture pratique*, Vol. 1, No. 21, pp. 657-659. Paris, May 22 1913.

As a result of some trials carried out at Juancho in the province of Buenos Aires a yield of nearly 8 tons of beet per acre was obtained, with an average sugar content of 14.3 per cent. The circumstances were unfavourable to the crop, and it is estimated that the yield could easily be raised to over 13 tons per acre, or in other words that sugar beet crops can be produced in the Argentine equal both in yield and quality to those produced in France.

941 - **Action of Flowers of Sulphur on Sugar-Beets.** — URBAN, J. (Experiment Station for the Sugar Industry at Prague) in *Zeitschrift für Zuckerindustrie in Böhmen*, Year XXXVII, Part 3, pp. 441-444. Prague. June 1913.

This paper gives the results of experiments on adding flowers of sulphur at 180 lbs. per acre to rows of sugar-beets. Averages :

	Roots		Juice	
	weight	sugar	polarisation	purity
	gr.	%		
Beets with sulphur (3 rows) . . . . .	444	20.53	22.56	92.5
» without » ( » ) . . . . .	435	20.60	22.48	92.3

The experiments will be repeated in a different form.

VARIOUS  
CROPS

942 - **Remarks on Hop-Growing.** — HITIER, H. in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, Vol. 119, No. 5, pp. 685-698. Paris-May 1913.

A review giving an account of the extension of hop cultivation in France, Bohemia, Bavaria, England and Belgium. In the case of these centres of production, information is also given regarding the cultivation, harvesting, drying and quality of the crops. For Belgium, data have also been collected as to the cost per hectare of growing hops and on other subjects of economic importance.

MARKET  
GARDENING

943 - **The Horticultural Industry at Ghent.** DELMOTTE, R. in *Revue économique internationale*. Year 10, Vol. II, No 1, pp. 7-28. Brussels, April 15-20, 1913.

The writer first describes the botanic and scientific horticulture of the beginning of the nineteenth century and its representative: The Royal Society of Agriculture and Botany founded in 1808, and then proceeds to give an account of the evolution of this industry.

The collector who cultivated thousands of different species of plants has now given place to the market gardener who grows large quantities of two, or three different kinds of plants. This evolution of horticulture at Ghent, which was complete in 1880, gave rise in that year to a powerful organization, the syndical chamber of Belgian Horticulturists. Although this institution chiefly represents the commercial and practical side of the trade it has shown from the first its firm intention of working harmoniously with the senior association, the Royal Society of Agriculture and Botany. Four years after the creation of the syndical chamber, the two Societies organised, at their joint expense, monthly meetings for the valuation of horticultural products. These periodical meetings have been held uninterruptedly ever since and have become more important every year.

Every five years, they are rendered more attractive by a flower show whose development is shown by the figures on the next page.

The town of Ghent and its suburbs boast of 720 horticultural establishments, including 5000 greenhouses, and employ over 3000 hands.

In 1837 the value of the total export of plants from Belgium only amounted to £60 000 per annum. In 1911, the exports from East Flanders, or rather from the neighbourhood of Ghent, to the United States reached the same figure, while the value of the total exports for the same year amounted to £545 356 of which the district of Ghent was responsible for 54.5 %.

In 1912, the worth of the total exports from the district of Ghent alone exceeded £400 000. The principal countries supplied by Belgium are:

Germany to a total value of . . . . .	£164144 in 1911
France " " " . . . . .	"105307 "
The United States " " " . . . . .	"94795 "
England " " " . . . . .	"56391 "
The Netherlands " " " . . . . .	"33366 "

Without making any absolute statement on the subject, it may be said that the plants apparently most in request in the United States are

Year	Number of exhibits	Area of exhibition buildings sq. poles	Number of competitions	Number of prizes awarded
1839	3 722	40	20	22
1844	5 200	"	31	59
1852	3 680	"	34	67
1857	3 066	"	50	89
1862	3 688	"	65	124
1868	9 000	120	241	438
1873	11 000	"	291	"
1878	11 500	200	"	457
1883	11 660	200	"	"
1888	12 000	220	417	"
1893	13 960	240	660	"
1898	15 000	270	720	"
1903	15 796	280	670	531
1908	18 000	400	760	"
1913	?	1200	841	1710

palms, araucarias, azaleas, begonia tubers, and laurels; while to Russia, and especially Moscow, are sent cut flowers, palms, laurels and rhododendrons. Orchids are exported to Paris, Berlin, London, St. Petersburg, Vienna, Rome, Madrid, Amsterdam, Stockholm, Copenhagen etc; new varieties of orchids and aspidistrias find their way to London; and there is a market in Northern France for fruit trees, forest trees etc.

What are the economic factors which have allowed the modern horticultural industry to become, as it is at the present day, one of the first industries in Ghent? The chief factor is incontestably the climate. The plain of which Ghent occupies the centre being only 31 miles from the sea, and in places below sea-level, enjoys a maritime climate. The dominant west winds are laden with warmth and moisture derived from the Gulf Stream and maintain a relatively uniform temperature. The second factor is the nature of the soil. With the exception of the Escaut and Lys valleys, the environs of Ghent have a sandy permeable soil which allows of azaleas and rhododendrons, the two specialities of Ghent being grown in the open from April to October. These plants are placed in beds 5 feet wide, dug

out from 4  $\frac{1}{2}$  to 6 in. and filled in with half-decomposed leaf-mould from the neighbouring oak and beech woods. The subsoil furnishes plenty of non-calcareous water which is an essential in watering azaleas.

The facilities of transport: a network of railways, tramways, high roads and canals also assist in the development of this suburban industry.

The fourth and by no means the least important factor is the cheapness of labour in Flanders. The horticultural labourer, without any special training receives an average daily wage of from 2s. to 2s.5 *d.* Further, horticulture in Ghent and the surrounding districts having been a specialised industry for centuries, it has created a class of experienced workers who thoroughly understand the taking of cuttings and the grafting of azaleas as well as the care of the other local horticultural specialities.

In addition, we should mention that owing to the influence of the Syndical Chamber of Belgian Horticulturists a special division known as the Horticultural Office has been created in the Ministry of Agriculture.

FRUIT-GROWING 944 - **Systems of Pruning Vines, and Distance Apart for Planting.** — VIDAL J. L. in *Revue de Viticulture*. Nos 1013, 1014, 1015 and 1017; pp. 689-693, 713-720, 752-756 and 814-819. Paris, May 15, 22 and 29, and June 12, 1913.

The experiments discussed in this article are concerned with plots of vines at Marsville, belonging to the Cognac Vine-growing Station. The vineyard was planted up in 1901 and 1902. The soil is poor and thin, and contains 50 per cent. of calcium carbonate. It has received no manure since the vines were planted. Twenty-four different stocks, chosen from those best suited to calcareous soils, are each represented by a square of 100 vines. *Rupestris* du Lot is taken as a control at eight different places, thus forming eight plots of 100 each.

Half of each plot is grafted with Folle Blanche, the other half with Colombard; the first variety is a weak grower and generally grafts badly, while the second binds much better with most stocks.

Each of the two grafted varieties is pruned and trained in three different ways: 1) in the shape of a vase, with props; 2) on Guyot's system, on wires; 3) on Royat's system, a simple cordon, also on wires. The vintage is weighed every year according to the stock, the system of pruning and the variety grafted on; the density of the must is determined in the same way. At pruning, the weight of the canes is also determined for each class.

*Systems of pruning.* — The most striking point shown by the writer's investigations is that for the climate of the Charente departments, hard cutting with long canes gives the heaviest yields, and at the same time hardly affects the quality of the wine or the vigour of the vine. Thus, in his experiments Royat cordons give much better yields than vases; they are also better than Guyots with Folle Blanche and equal with Colombard, whose lowest buds are liable to bear little fruit. The sugar-content of the grapes is decidedly higher on cordons than on Guyots, with equal crop. This comparison cannot be made with vases, as their crop is so much less; but looking at the average vintage weights, one finds that,

though the figures for the vases are very near those for the Royat pruning, yet the must of the latter is denser than that of the former. Lastly, the growth of the cordons, which began by being the least, eventually gives the highest general average; it is well above that of the Guyot system with both the varieties; it is also above the vases with Colombars, and about equal with Folle Blanche, in spite of the yield of grapes being three times as heavy.

Barring special requirements of particular varieties, the conclusion which holds for the Charentes should do also for other regions of similar climate that is moist, with considerable atmospheric humidity, and with evaporation from the leaves not too intense (Centre and East), and where there is no hurry in ripening the grapes; pruning for long canes ought to do well in such regions. It appears to be so in Champagne. The same should be true for places in which moisture of the soil can compensate for the more or less dry state of the air (plains and valleys).

The most drought-resistant stocks place the grafts which they bear under the conditions they would have in moist soil on stocks requiring more moisture. It is with these that the best results from long canes may be expected.

The Guyot pruning and the other types which may be classed with it, seem to suffer less from lack of moisture; but all the same Chanzit and Barba have also had better results with cordons than with Guyots in poor and dry soil in the South, where the air is also dry.

But there is no doubt that the vase is the system which exposes the vines least to drought. Provided a sufficient number of eyes are left, this system can give good yields like the other two.

Lastly, in vineyards producing fine wines, where quality is all-important, hard cutting with long canes is greatly preferable to leaving a lot of wood. The first will give a larger yield of equal quality, or if the yield is the same the quality will be very much higher. The more the vintage can be kept back, the more true does this become.

*Closeness of planting.* — The deductions to be drawn from the first results at Marsville on this subject are here given.

The distance apart for planting should be determined in practice by consideration of the moisture conditions of both soil and air; further the space between the rows should as far as possible be made convenient for the implements and teams to be used. The distance between the vines in the rows will be the most variable factor, and will allow a fair concordance between physiological requirements and practice. Close planting, at less than 3 ft. 3 in.  $\times$  ft. 3 in., is to be condemned outright, as far as the experiments show at present, at any rate for the soil and climate of the Charentes. The 3 ft. 3 in.  $\times$  3 ft. 3 in. square, though so far very productive, suffers from drought, and sometimes also from grey-rot: it is apparently not to be recommended. It also appears that distances of 6 ft. 6 in.  $\times$  5 ft. are too large; they do not give a maximum total yield. Between these limits, the experiments here described cannot yet furnish precise indications; but the local practice of planting about 1800 stocks to the acre seems to be sound.

Name or No. of stock	Weight of grapes per vine. Av. of the three pruning methods	Order according to weight of produce	Weight of prunings per vine Av. of the three methods	Order according to vigour of growth
	lbs.		lbs.	
Rupestis du Lot. . . . .	2.32	23	1.13	9
34 E. M. . . . .	2.51	20	1.24	3
420 B. . . . .	2.81	15	0.98	20
41 B. . . . .	3.46	4	1.10	10
1202 . . . . .	2.59	18	1.19	5
Aramon X Rupestris Ganzin No. 2 . . . . .	2.78	16	1.31	2
Aramon X Rupestris Ganzin No. 1 . . . . .	4.63	1	1.36	1
3306 . . . . .	3.23	9	1.03	14
3309 . . . . .	3.32	8	0.95	21
Berlandieri Rességnier No 1.	3.04	11	1.20	4
Berlandieri Rességnier No. 2.	2.60	17	1.02	16
81-2 . . . . .	2.42	21	0.71	24
161-49 . . . . .	3.10	10	1.08	11
Gamay Goudere . . . . .	2.85	14	1.19	6
420-A. . . . .	3.35	6	0.86	22
301-64 . . . . .	3.38	5	1.14	8
301-37 . . . . .	3.01	12	1.08	13
101-14 . . . . .	2.34	22	0.98	18
17-37 . . . . .	2.56	19	1.02	15
Berlandieri d'Angeac . . . .	3.32	7	1.08	12
Berlandieri Lafont No. 9 . .	2.88	13	0.98	19
33 A. . . . .	3.60	3	1.17	7
554-5 . . . . .	3.63	2	1.00	17
157-11 . . . . .	1.47	24	0.74	23

*Stocks for calcareous soils.* — The 24 stocks used for the experiment were chosen from the best known at the time of planting. The general averages of the figures obtained during the seven years of the experiments are given on the preceding page.

Making a classification of the best bearers which are also strong growers, we have, in order of merit: I, Aramon X Rupestris Ganzin No. 1; II, 33 A; III, 41 B; IV 301-64, all among the first five for heavy cropping and also among the first ten for growth of wood. Then: V, Berlandieri d'Angeac, and VI, 161-49, which are 7th and 10th for yield of fruit and 12th and 11th for weight of shoots. Lastly: VII would be Berlandieri-Rességuier No. 1, 11th for fruit but 4th for growth. The first five all have an average yield per vine of more than 3  $\frac{1}{4}$  lbs., the highest reaching 4  $\frac{1}{2}$  lbs.; the 6th and 7th only reach 3 lbs.

Examination of the series of yearly figures for weight of shoots shows that these stocks keep up their growth admirably and keep on bearing; none of them shows any falling off.

Besides these first class ones, there are other good bearers, which are rather lacking in vigour of growth, at any rate in this unmanured soil. Such are: 554-5 and 420 A, which show no tendency to exhaustion; 3306 and 3309, which are subject to chlorosis; 301-37, a heavy bearer, but quite gone off as a result of chlorosis; Berlandieri Lafont No. 9, a fairly good cropper; Berlandieri-Rességuier No. 2, here not as good as No. 1, though generally considered superior to it; 420 B, which seemed at first better than 420 A in this vineyard, but now bears much less, though its growth is about the same; Gamay Couderc, vigorous and fruiting fairly well.

It is interesting to note that 41 B, which is widely grown on calcareous land in the Charentes and elsewhere, has maintained its excellent reputation in these exact experiments; and, indeed, without manure in a not very fertile soil.

*Folle Blanche and Colombard.* — In these experiments Colombard has turned out better than Folle-Blanche, which is not in agreement with the general opinion.

945 — *The Oberlin Vine Hybrids: their Value and Use.* — ROY-CHEVRIER, J. in *La Vie agricole et rurale*, Year 2, No. 27, pp. 6-10, figs. 1-6. Paris, June 7, 1913.

M. Oberlin, Director of the Vine-growing Institute at Colmar, many years ago obtained some very remarkable direct bearers by crossing the Gamays and Pinots with Riparia. The writer has grown some twenty of these varieties and has also made tests of their wine; so long ago as 1894 he was able to state that some of these Riparia hybrids of which the best bearers are Oberlin 595, 604, 605 and 716, were resistant to phylloxera; this is still the case at present, and they are also highly resistant to fungus diseases; further, their wine is of unusual composition and very rich containing 15 to 17° of alcohol, *with a correspondingly high figure for total acidity.*

Direct bearers, easy to propagate, very resistant to phylloxera and fungus diseases, and thriving under varying conditions (Nos. 604 and 605 can stand a high lime content), have a great value for mixed farms in which

field work may interfere with the care of the vineyard. Further, their rapid flowering, never hindered by the bunch mildew, keeps them free from the first generation of *Conchylis*. But their chief merit is their remarkably early ripening, which takes place at the same time as with the Early Vosges Gamay or even before it; further, in spite of the unsettled weather to which the vines in the cold East region are exposed, the Oberlin hybrids always give a highly alcoholic wine, owing to the perfect ripeness of their grapes. Contrary to the general rule that acidity decreases with increase of sugar, in these grapes the two reach a maximum together. Thus No. 595 often passes 17° of possible alcohol with 9 gms. of acid calculated as sulphuric acid; 604 reaches 15° of alcohol and 8 gms. of acid; 605, 16° and 9 gms., and 716, which had more than 15° of alcohol, retains 13.6 gms. of acid.

The value of the Oberlin is therefore in getting a full and alcoholic wine without expense and trouble.

The only fault to be found with these vines is their low yield; the small grapes full of pips, of their rather loose bunches, often give up their juice with difficulty. Further, these very vigorous hybrids, of almost a wild nature, require a tree-like growth on trellises, or at any rate an extension, of the cordons, to bring out their inherent fertility. Training as horizontal cordons with double spurs is considered by Oberlin and the writer as the best means of treating them.

Planting should be in deep and rested soil, in quincunx, at 16 ft. in the rows and 4 ft. 6 in. between the rows. Each cordon thus occupies about 8  $\frac{1}{2}$  sq. yds. which means not quite 600 per acre.

The second season only two shoots are left; the third season the better of these is trained onto the wire at 20 ins. from the ground, but to save tying it is simply twisted round it. The fourth season this young cordon is cut with single spurs, and is carried further along the wire. The fifth season the single spurs are changed to double ones, except on the prolongation of the cordon (which should now reach to the next vine), where they are left single. By the sixth or seventh season, according to the strength of the shoots, the cordon is established all the way along, and can be pruned with double spurs from one end to the other. The double spur is easy to deal with: one of the spurs has two eyes and the other four; at the next pruning the four-eyed spur is cut back and the shoots of the two-eyed spur supply the two new spurs, and so on. The spur may always be renewed on the cordon, as the Riparia hybrids keep on breaking from the old wood.

The advantage of the double over the single spur is obvious: the single one, having two eyes, will generally bear four bunches; the double, with six eyes may have as many as twelve bunches giving three times the crop.

On this method, the Oberlin hybrids have given high yields and curiously enough without any impoverishing of the constitutional richness of their wine.

946 - **Fruit Production and Trade in Hungary in 1911.** — Extract from the Report of the Statistical Year Book on the Work of the Government) in *Volkswirtschaftliche Mitteilungen aus Ungarn*, Year VIII, Part V, pp. 517-520. Budapest, May 1913.

The climatic conditions of 1911 having in the main been favourable to the fruit harvest, the results obtained from most kinds of fruit trees were better than in 1910. The data on exportation are satisfactory: The quantities exported tend to increase whilst those imported diminish. The great decrease of importation in 1911 is not accompanied by a corresponding decrease in value, on account of the rise in prices of some kinds of fruit; on the contrary whilst the importation in 1910 represented a value of £ 338 600. That of 1911 amounted to £356 443. On the other hand with the quantity of the fruit exported in 1911 the value also increases and reaches £868 310 whilst all the exports of fruit in 1910 attained only £566 978. The annexed table shows the quantities and values of fruits imported and exported during the period 1909-1911.

The greatest part of the Hungarian fruit trade is with Austria; thus of 507 400 cwt imported in 1911, 193 700 (38.2 per cent of the total import) came from Austria and of the 1 500 578 cwt. exported, 1 024 040 cwt. went to Austria. After Austria comes Serbia; that country exported into Hungary 169 670 cwt. of fruit (33.4 per cent. of the total imports). 65 601 cwt. (12.9 per cent.) were imported from Bosnia, 48 720 cwt (9.5 per cent.) from Italy, whilst only 11751 cwt. (2.3 per cent.) came from Rumania, 6522 cwt (1.3 per cent.) from Turkey in Asia and 5119 cwt (1. per cent.) from Turkey in Europe.

Of the fruit imported from Austria 71.9 per cent. consisted of apples and pears, 7.9 per cent. of juniper berries, 4.2 per cent. cherries and egriots. Among the fruit imported from Bosnia 46.6 per cent. were dried plums, 24.1 per cent. fresh plums, 10.8 per cent. walnuts. In the imports from Serbia, 69.3 per cent. were apples and pears, 17.3 per cent. fresh plums and 8.6 per cent. dried plums. From Italy the chief fruit imports were apples, pears, and juniper berries; from Rumania walnuts and prunes; from Turkey in Europe walnuts and from Turkey in Asia walnuts and hazelnuts.

Among the purchasers of fruit exported from Hungary, Germany comes after Austria. In 1911 Hungary sent to Germany 425 287 cwt. (28.3 per cent.) and to the United States which come next only 8273 cwt. Of the fruit exported to Austria the percentage was the following: 23.7 apples, 21.1 fresh grapes, 12.4 cherries and egriots, 6. apricots. To Germany the exportation was chiefly apples (84.3 per cent.) and fresh plums (7.2 per cent.) whilst to North America it was especially walnuts.

*Imports*

	Weight			Value		
	1909	1910	1911	1909	1910	1911
	cwt	cwt	cwt	£	£	£
Apples, Pears, Quinces . . . . .	636 144	351 693	209 203	222 561	134 575	127 676
Fresh plums. . . .	146 194	98 524	51 158	21 610	21 927	16 257
Apricots . . . . .	1 480	638	348	1 031	912	476
Cherries, Egrigots, Fresh Peaches .	29 197	15 815	15 526	20 341	13 799	12 094
Fresh Melons . . .	7 671	4 843	3 414	3 489	2 260	1 196
Other Fresh Fruits.	5 072	4 572	6 370	2 577	2 260	3 565
Juniper berries. . .	12 074	15 712	31 252	6 423	6 780	19 467
Dried plums. . . .	122 256	41 281	49 397	49 445	44 132	64 151
Other dried fruits .	6 402	3 962	2 393	4 362	2 379	2 657
Fresh grapes. . . .	12 290	8 657	8 718	6 820	7 216	9 151
Walnuts. . . . .	49 611	40 472	29 298	36 796	41 594	31 846
Hazelnuts. . . . .	12 286	19 139	19 322	32 915	60 944	68 00
Total . . . . .	1 040 678	605 308	507 400	412 370	338 778	356 547

*Exports.*

	cwt	cwt	cwt	£	£	£
Apples, Pears, Quinces . . . . .	151 064	106 912	638 638	70 103	52 696	204 678
Fresh Plums. . . .	90 699	292 093	217 667	29 183	96 629	98 374
Apricots. . . . .	172 377	34 604	71 867	93 259	44 568	90 761
Cherries, Egrigots, fresh Peaches . .	105 701	47 974	140 488	61 499	33 180	77 438
Fresh Melons . . .	79 466	68 508	79 987	21 491	18 200	24 504
Other fresh fruits .	38 580	47 488	47 265	19 389	30 254	31 166
Juniper berries. . .	19 131	15 474	4 757	10 190	6 741	2 974
Dried plums. . . .	18 030	12 991	13 304	11 816	14 592	17 803
Other dried fruit .	5 550	9 820	9 895	3 925	6 582	8 327
Raisins. . . . .	201 643	155 590	221 451	139 809	147 462	201 387
Walnuts. . . . .	23 573	57 403	54 504	23 949	114 710	108 327
Hazelnuts. . . . .	256	1 098	755,71	317	1 507	1 031
Total . . . . .	901 071	850 754	1 500 578	484 930	567 129	866 770

947 - Bananas, Their Cultivation and Utilization. Trade in Banana Products. Classification of the Genus *Musa*. — WILDEMAN, E. de in *Annales du Musée Colonial de Marseille* 1912. Extract, Editor Challemeil, Paris 1913.

Bananas are not yet sufficiently, well understood both from the scientific and from the economic points of view. Great confusion prevails as regards the systemization of the genus *Musa*, although few plants are capable of yielding as much valuable produce on a small space and with little attention, as the banana. Dr Zagorodsky (1) mentions the following amongst the products of the fruit bearing banana.

1) Fresh fruit for export; (2) Dried fruits; (3) and (4) Preserved and crystallized bananas; 5) Banana starch and flour; 6) Sagù, 7) a substitute for coffee; 8) a substitute for rubber; 9) liqueurs, alcohol, wine, beer, vinegar etc; 10) a cattle feed. To complete this list it should be added that all bananas, furnish a fibre extracted from their leaf-sheaths and leaves, but this has not yet been studied systematically.

It appears to the writer that the time has now come to turn to better account this fruit which is so easily grown in the Tropics and always consumed in increasing quantities in Europe. A rapid survey of the statistics of banana export and consumption suffices to prove the truth of this statement. The importation of bananas into Germany increased tenfold between 1906 and 1910. Seven or eight years ago, France and England consumed respectively between 50 and 60 thousand and 2 million bunches of bananas. Now, on the other hand, from 150 to 200 thousand are sent to Paris, while millions are consumed in England. The United States of America alone take 40 millions of bunches worth £ 2 500 000 and America exports the fruit to Europe to the value of :

£ 1 600 000	Great Britain
» 200 000	Germany
» 100 000	France

Jamaica, Barbados, Domingo and Costa Rica have immense plantations in full bearing. In 1909, Jamaica exported 16 712 210 bunches of bananas, and the area occupied by plantations in 1909-1910 was 69 000 acres. Costa Rica has become a great centre of production and 100 000 acres capable of producing from 700 000 to 12 000 000 bunches monthly have been devoted to this crop.

The writer, after having given some information respecting the application of cold storage methods to banana transport, and the most important question of manuring the soil (2), deals with the diseases and noxious insects which attack the banana tree and with the industry of banana drying. He then enquires which is the best variety for propagation and how it is to be recognized. These queries are difficult to answer for the lack of two

(1) Dr. M. Zagorodsky. Die Banane und ihre Verwertung als Futtermittel. Supplement to the *Tropenpflanzer*, XII, 4, 1911.

(2) See No. 1278, B September 1912.

things : 1) a satisfactory classification of the genus *Musa* and 2) a reliable basis of information which would throw some light upon the economics of banana culture. In the hopes of collecting some information which will lead to a rational solution of the problems the writer proposes to draw up a circular letter embracing the following list of questions.

### *Enquiry concerning Bananas.*

*Locality.* — Climatic and geographical conditions, and the geological origin of the soil suitable to the plant.

#### *Habit of the plant :*

Presence and absence of a species of bulb.

Height, thickness and colour of the stem.

Colour of the cellular sap of the sheaths which form the stem.

Length, width and terminal form of the leaves. Colour of the leaves on upper and lower surfaces.

Colour of the mid-ribs.

Colour of the cellular sap of the leaves.

Resistance to wind, persistence of the leaves or total disappearance in winter.

#### *Form of inflorescence:*

Inflorescence bracts, their size and colour. Number of « hands » per inflorescence.

Number of flowers, or fruits, per « hand ».

Is the number constant for the whole inflorescence? It would be useful to add to the data of this enquiry samples of flowers and of fruit; the flowers should be dried or preserved in alcohol, or formalin; the fruits preserved in formalin. In the case of fruits containing seeds, it would be interesting to include samples for purposes of study. It would be well to send with the above samples, drawings and photographs referring to all the questions of the enquiry.

To those persons who are able to carry the enquiry further, it is suggested that they should furnish additional information with regard to the botanical characters, *i. e.* :

#### *Flowers:*

Their colour and length. Perianth: number of lobes and their shape; stamens: number; anthers: colour and length; styles: length, colour.

#### *Fruit:*

Shape, colour and size when ripe. Seeded or seedless.

Colour and flavour of the pulp.

#### *Seeds:*

Colour, shape, size, state of the epidermis, germination.

#### *Uses:*

Unripe, ripe, and preserved fruits, fibre, pith, or central portion, use of rachis.

#### *Various:*

Native names; cultivation and diseases: industrial and economic use of the different parts; trade and statistics.

948 - **Export of Shoots of Date-Bearing Palms.** — TRABUT L. in *Bulletin Agricole de l'Algérie et de la Tunisie*, Year 19. No. 9 pp. 185-187. Algiers. May 1, 1913.

The introduction of date culture into the desert regions of the Western United States of America has given rise to a large importation of shoots, or «djebars», from the oases of north Africa. For some years, Algeria has exported annually from 8 to 10 thousand «djebars», and the Algerian planters have become apprehensive of future competition, and alarmed at the rise in price of the necessary shoots for their own plantations.

The writer draws attention to the fact that competition is inevitable and that the rise in price of which the colonists complain is not excessive. Further since it is to be foreseen that for a considerable time it will be possible to supply «djebars» of the Deglet Nur variety at about 4s. each, it would be better to cultivate this variety specially for the production of shoots. To this end he advises that the latter should be carefully selected, planted in nurseries and frequently watered; and after three years there should be six or eight shoots round each parent plant; 800 cuttings or even more under suitable conditions may be planted per acre and would prove more remunerative than the production of dates.

The writer mentions other good varieties for export: 1. The Tafilalet date, called «Medjoul», which the Department of Agriculture at Washington buys at the rate of £2 per guaranteed «djebars». The fruits are large and little known on the French markets, being sent to Tangiers and to London. In Tangiers, the average price is 200 francs per rookilos. (£4 0s 7d per cwt.) 2. The Manakor variety from Djerid also called the Bey's date. The fruit is excellent, and the variety should be propagated at present, it is still rare and as the old palms do not yield shoots, it is therefore necessary to obtain seeds. This is being done, and the variety proves to be fairly constant from seed especially in the Djerid oasis, where good strains are to be found.

The progress due to the work of the American Experiment Stations will certainly have a good influence also upon the North coast of Africa, where the cultivation of the date palm has been considered as fixed by the practice of centuries.

949 - **Management of the State Forests in Bavaria.** — ENDRES, in *Forstwissenschaftliches Centralblatt*, Year XXXV, No. 6, pp. 289-296. Berlin, June 1913.

FORESTRY

Owing to legislative measures and to the work of the Bavarian Forest Administration, it is possible to give an account of the total production of the Bavarian State Forests of the 4-year period 1908-1911, compared with the 5-year period 1903-1907, but details of the principal and by-products cannot be given as official statistics in these matters are no longer collected.

*Total Production.*

	1903-1907 (mean)	1908	1909	1910	1911
Total forest area . ac.	2 060 699	2 018 136	2 019 499	2 016 832	2 019 687
Total volume . cu. ft	132 968 060	144 694 000	168 780 000	167 367 000	172 821 000
» » (relative)	100	109	127	126	130
Volume per acre cu. ft.	64.5	71.6	83.5	83.0	85.6
Surplus compared with 1903-1907:					
total . . . cu. ft	—	11 726 000	35 812 000	34 399 000	39 853 000
per ac. . » »	—	5.8	17.7	17.0	19.7
Timber more than 27 in. in diam:					
total . . . cu. ft.	115 133 000	125 129 000	147 695 000	144 636 000	152 816 000
» (relative) . .	100	109	128	127	133
per ac. . . cu. ft	55.9	62.0	73.1	71.7	75.6
Surplus:					
total . . . cu. ft.	—	9 921 000	32 562 000	31 502 000	35 554 000
per acre . . » »	—	4.9	16.1	15.2	17.6
Total receipts . . . £	2 024 856	2 428 899	2 776 527	2 837 289	3 024 663
Mean « per cu. ft. in pence. . . . .	3.65 <i>d</i>	4.0 <i>d</i>	3.9 <i>d</i>	4.0 <i>d</i>	4.1 <i>d</i>
Do. (relative) . . . .	100	110	108	111	115

From the data given the following facts become evident :

I. That the production of timber is greater owing partly to an increased cutting of coniferous trees and partly to better management.

II. That prices of timber have risen (8 per cent from 1903-1907 to 1911).

III. That there is a slight gradual fall in prices for firewood during the last few years, this will only rise again with the decreasing purchasing power of money as the relation between the increase of population and the demand for firewood is undoubtedly declining.

*Timber.*

	1903-1907 Mean	1908	1909	1910	1911
Total . . . . . cu.ft.	59 403 000	68 586 000	82 808 000	84 019 000	92 636 000
(relative) . . . . .	100	115	139	141	156
Per acre . . . . . cu.ft.	28.8	34.0	41.0	41.6	45.6
Per cent of total production	44.7	47.4	47.0	50.1	53.6
» the timber more than 2.7 in. in diam. .	51.6	54.7	56.1	57.3	60.6
Surplus:					
total . . . . . cu.ft.	—	9 182 000	23 415 000	24 510 000	33 235 000
per acre . . . . . »	—	4.5	11.6	12.1	16.4
Coniferous wood:					
total . . . . . cu.ft.	52 446 000	60 992 000	74 385 000	76 673 000	84 337 000
» (relative) . . . . .	100	117	142	146	161
% of timber . . . . .	88.4	89.0	89.7	91.3	91.1
Broad leaved wood:					
total . . . . . cu.ft.	6 922 000	7 593 000	8 441 000	7 275 000	8 335 000
» (relative) . . . . .	100	109	122	105	120
% of timber . . . . .	11.6	11.0	10.3	8.7	8.9
Oak . . . . . cu.ft.	3 164 000	3 224 000	3 681 000	3 111 000	3 426 000
Total receipts for timber £	1 508 833	1 715 883	1 974 073	2 084 828	3 369 816
Mean receipts per cu.ft. . . . . pence	5.7	6.0	5.7	6.0	6.1
Do. (relative) . . . . .	100	105	100	105	108

*Firewood.*

	1903-1907 Mean	1908	1909	1910	1911
Total . . . . . cu.ft.	73 565 000	76 108 000	85 962 000	83 419 000	80 205 000
(relative) . . . . .	100	103	117	113	109
Per acre . . . . . cu.ft.	35.7	37.7	42.5	41.3	39.7
Surplus . . . . . »	—	2 543 000	12 043 000	9 853 000	6 640 000
Total receipts. . . . . £	615 893	715 015	802 453	752 460	709 285
Mean » per cu.ft. pence	2.0	2.2	2.2	2.1	2.1
Do. (relative) . . . . .	100	113	112	108	106

- 950 - **Prize Competition for the Encouragement of Afforestation in Hungary.**  
— Official communication in *Erdészeti Lapok*, Year III, Part XI, pp. 502-504. Budapest, June 1913.

Paragraph 165 of the forest law XXXI of 1879 deals with the afforestation of arid land, land worn into gullies, and shifting sand; this work is of great economic importance, and to encourage such planting in 1913 the Minister of Agriculture has organized a prize competition, the prizes being supplied from the national forest fund. They will be as follows:

Eleven "grands prix" of £40, £32 and £24 for areas of at least 25 arpents (35 acres).

Ten first-class awards of £20 and £16 for areas of at least 10 arpents (14 acres).

Nine second-class awards of £12 and £8 for areas of at least 5 arpents (7 acres).

The following will be eligible for these prizes: 1) landowners who have undertaken afforestation of the above-named types of land, in the spring or the autumn of 1913, without State subventions; 2) those who, with State assistance, have undertaken this work under conditions of exceptional difficulty, and with unusual care and success, thus benefiting the public more than themselves.

Competitors must undertake the whole of the afforestation work as laid down in paragraphs 2 and 4 of the forest law cited. The plantations admitted to the competition will be judged in 1918. The competitor will not be eligible for a prize unless the plantation is still in his possession at the time when the prizes are awarded.

Inscription of planting carried out in the spring will be received up to the end of July, that of autumn planting to the 25th of December; it should be addressed to the Public Forest Administration Committee or to the Royal Forest Inspectorate. Such inscription should include a detailed description of the place and give the area afforested and an exact enumeration of the species of trees used.

## LIVE STOCK AND BREEDING.

### HYGIENE

- 951 - **The Campaign against Flies.** — BAUWERKER in *Zeitschrift für Gestiikunde und Pferdenacht*, Vol. VIII, Part 6, pp. 121-129. Hanover, June 1913.

Flies are often a real pest to man and domestic animals, especially when they invade stables. The importance of the destruction of flies has even been the subject of a discussion by the Budget Commission of the Prussian Chamber of Deputies, in connection with the removal of the Thoroughbred stud from Graditz to Strausfurt, the latter place being infested with flies.

The reasons for destroying these persistent and dangerous insects are well known, and many methods of destruction have been devised; but the writer considers that appreciable and durable results can only

be obtained by giving up half measures and undertaking an energetic and systematic campaign. Considering the importance of the question, he has thought well to give an account of the methods he has used in the stud under his direction at Eichelscheiderhof, as the results have been very satisfactory. In 1887 when he undertook the direction, the stud was so badly infested by flies that living there was most disagreeable in summer.

He began by hanging up in the stables and all dwellings, without exception, pieces of limed wood, bigger and longer for the stables, thinner and shorter for the houses. For some time the flies had to be removed and the sticks re-limed every day; but when the flies were somewhat reduced this was done only every two or three days. In the earlier years the cost of the lime was considerable (£ 4 to £ 4 10s), but it soon diminished considerably.

Various other means were employed. Further, the general conditions were much improved by the drainage of the land round the stud farm, which was rather marshy and provided excellent conditions for flies to breed. Great benefit was also derived from scrupulous cleanliness throughout the homestead, including disinfection of closets and cess-pools, and ventilation of the stables. Flies dislike draughts, whereas the animals, being accustomed to open air when quite young, do not take any ill effects from them.

The flies were also destroyed in places where they like to assemble; a great number were burnt by spirit lamps, being collected at the approach of winter on the ceiling and walls of the kitchens; in this way many eggs were destroyed before they had time to develop. It was found that white-washing with a sprayer was an excellent means of destroying the eggs; this was still better when a little formalin was added to the milk of lime. For disinfection, a strength of 2 or 3 per cent. was used; but 1 per cent. does for ordinary purposes.

Formalin is an excellent fly-poison. The writer had good results with a method he got from a paper: this consists in setting out on a plate small slices of bread soaked in a pint of milk to which two spoonfuls of formalin have been added. A pint was found to be enough for large spaces, such as stables; while for smaller places, such as dwelling-rooms, half a pint is sufficient.

Having undertaken a systematic fight, the writer did not neglect any of the usual methods, such as fly papers and fly traps; but he did not find them very successful.

Attempts were made also to encourage as much as possible the natural enemies of flies, especially insectivorous birds. Swallows and martins were the first to be pronounced useful; as it was found that sparrows were preventing their increase in numbers by occupying their nests during their absence, a campaign against these was undertaken, and quantities were destroyed. The number of swallows and martins steadily increased, and they now nest all about the buildings.

The increase of starlings was encouraged by putting up Berlepsch nesting-boxes for them. Other insectivorous birds were encouraged in every

possible way (planting of pines and fruit-trees, destruction of their enemies: martens, polecats, weasels, squirrels, birds of prey, etc.).

Quantities of flies were also destroyed by the large numbers of fowls kept at Eichelscheiderhof.

Thanks to all these measures, the stud-farm has now been very largely freed from the pest.

At the end of the article the writer alludes briefly to methods of protecting draught animals from flies and gadflies — close metal nets, and treating the skin with repulsive substances, such as fish-oil.

952 - **Resistance of Various Animals to Arsenic.** — WILBERG, M., with appendix by SCHIROKOGOROFF on pathologico-histological researches (Report of the Pharmacological Institute of the University of Jurjeff), in *Biochemische Zeitschrift*, Vol. 51, Part 4, pp. 131-252. Berlin, June 1913.

The subject of the resistance of animals to arsenic is of importance at present in view of the recent progress on the pharmacology of arsenic, particularly as regards the preparation and use of atoxyl and salvarsan. M. Wilberg's researches were directed to establishing the doses tolerated and the minimal fatal doses for various animals. After discussing the literature of the subject, he describes experiments on dogs, cats, rabbits, hares, rats, hedgehogs, guinea-pigs, fowls, pigeons, and adders; the doses tolerated are given in the following table.

Animal	Means of ingestion of the compound	Dose in gr. per kg. of body-weight	
		Potassium arsenite	Arsenious oxide
Pigeons . . . . .	buccal	—	1.786
	sub-cutaneous	less than 0.012	—
Rats . . . . .	sub-cutaneous	0.0156-0.0176	—
Hedgehogs. . . . .	sub-cutaneous	0.01-0.014	—
Rabbits . . . . .	buccal	—	0.015
	sub-cutaneous	0.008-0.01	—
Dogs . . . . .	buccal	0.03	0.03
	sub-cutaneous	0.007	—
	intravenous	—	—
Guinea-pigs . . . . .	sub-cutaneous	0.009	—
Cats . . . . .	sub-cutaneous	0.005-0.006	—
Hares . . . . .	sub-cutaneous	more than 0.005 and less than 0.008	—
Fowls. . . . .	buccal	—	less than 0.06
Adders . . . . .	sub-cutaneous	0.012	—

From these results it is clear that different animals do not show the same degree of resistance to the action of arsenic. Rats are the most resistant; then come hedgehogs, guinea-pigs, dogs, cats. Arsenic resistance has some relation to size: the smaller the animals, the greater it is. Man is the most sensitive of all animals, probably owing to the great development of his nervous system.

The subcutaneous tissue of dogs is very sensitive to injections of potassium arsenite, and becomes necrosed at the place of injection, as does the cutaneous tissue. Hares are much less resistant than rabbits to subcutaneous injections. With pigeons and dogs, vomiting readily takes place, so that strong doses of arsenic introduced through the mouth are almost without action.

For the minimal fatal doses, the writer has collected in a table the results of a great many investigators (Busscher, Brouardel, Rouyer, Salkowsky, Neucki and Sieber, Kochmann, Kunkel, Doyen and Morel, Fröhner, Hausmann). His experiments were made with hedgehogs, and gave doses of 0.011 to 0.015 of potassium arsenite by sub-cutaneous injection.

The article is followed by an appendix containing the results of pathologico-histological researches made under the microscope on various organs of dogs, cats and rabbits treated with arsenic.

953 - **Fate of Tubercle Bacilli outside the Animal Body.** BRISCOE, CHAS. F. in *University of Illinois Experiment Station, Bulletin* No. 161, pp. 277-375. Urbana, Illinois, November 1913.

The results of this experimental work are given in tabular form. The paper is accompanied by a bibliography referring to 160 publications.

It is seen from the above-mentioned table that tubercle bacilli in pure culture, spread in thin layers on sterile glazed paper slips and exposed to the direct rays of the sun, are killed in a very short time (1 to 4 minutes). When exposed to desiccation, pure cultures of these germs in thin layers are found to be dead in a few days. In sputum, and other foul material, they appear to live longer than the other nonspore-bearers, and are blown around so that the inhalation of dried sputum dust causes tuberculosis in test animals. Sunlight plays an important part in the disinfection of this dried tuberculous dust; thus dwellings, factories and places of business should have abundance of window space located so as to admit the light.

Tubercle bacilli in cow manure lived 73 days, when a pure culture mixed in a sample of manure was exposed to weather conditions in a pasture field in the shade, and as long as 49 days, when exposed to the sunshine. In a sample of dung from a tuberculous cow, they were dead at the first test, made 13 days after exposure. These experiments, which the writers were disappointed to be unable to repeat, are worth repetition.

Tubercle bacilli in garden soil and in a dead tuberculous guinea-pig buried in the latter were alive on the 213th and 71st days respectively.

In drinking water, which may be a source of infection, the bacilli of human tuberculosis and of bovine tuberculosis live for a year.

In butter kept at  $-10^{\circ}$  C., the tubercle bacilli retain their virulence longer than when the butter is kept at high temperatures (in the experiments they survived 274 days), and constitute a serious danger.

- 954 - **Modifications in the Milk of Cows suffering from Foot-and-Mouth Disease.** MEZGER, O., JISSER, H. and HEPP, K (Report from the Municipal Chemical Laboratory of Stuttgart) in *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel, sowie der Gebrauchsgegenstände*, Vol. 25, Part 9, pp. 513-551. Berlin, May 1913.

After a careful examination of the bibliography of the subject, the writers describe the methods adopted and the conditions under which they made their investigations. The results are shown on 26 tables, each dealing with one cow; complete analyses are given of the milk at various stages of the disease, with notes on the most striking phenomena in each case.

The conclusions arrived at are then compared with those of other investigators. It appears that the influence of the disease on the composition of the milk is not the same for animals of any one breed, nor for those in the same lactation period; it seems to vary in individual cases.

ANATOMY AND  
PHYSIOLOGY

- 955 - **The Alcohol Content of Milk after giving Cows Various Doses of Alcohol and under the Influence of Habit.** — VÖLTZ, WILHELM and PAECHTNER, JOHANNES in *Biochemische Zeitschrift*, Vol 52, Parts 1 and 2, pp 73-95 Berlin, June 25, 1913

The question, whether alcohol given with the food passes into the milk, and if so in what proportions, has often been studied but has not yet been satisfactorily answered; for this reason the writers have instituted some experiments on the subject.

The animals they experimented upon were two North German cows of the plains (Norddeutsche; Niederungskühe) weighing about 1100 lbs. each, of the age of 4 to 5 years and in the middle of their lactation. The experiments lasted from March 27 to April 29 of this year.

Cow No. 1 was fed good meadow hay, oat straw, malt germs, potato flakes, and dried yeast. During the experiment with alcohol she received with the alcohol 46.2 lbs. (sometimes 92.4 lbs.) of potato distiller's wash containing 1.98 lbs. dry matter and 44.22 lbs. water (or 3.96 lbs. dry matter and 88.44 lbs. water). The cow received the 44.22 lbs. of wash with the alcohol in one dose at noon, immediately after having been milked, or double the quantity in two equal doses, one at noon and the other in the evening.

It was not considered necessary to determine exactly the quantity of food consumed by this cow.

Cow No. 2 was given, the first day of the experiment (April 22), as well as during the preceding 13 days, 20.57 lbs. of dry matter under the form of dried beer yeast. From that date up to April 25 when the experiment ceased, the cow was fed only hay.

The alcohol, mixed with water, was given at the rate of 3.52 to 5.27 quarts of beverage, sometimes in one dose sometimes in two.

In order to determine in what quantity alcohol passed into the milk, the cows were milked three times a day; the milk, which was always faultless, was weighed and immediately portions of it — weighing 100 to 200 grams and sometimes as much as 500 to 1000 grams — were distilled.

The annexed table gives the quantities of alcohol found in the milk and those given to the cows.

Experiment	Cow	Quantity of absolute alcohol given c. c.	Quantity of absolute alcohol found in the milk		
			Daily c. c.	Per thousand	In percentage of the quantity given
I	I	200	0.49	0.09	0.24
2		400	2.58	0.42	0.65
3		400	1.15	0.18	0.29
4		400 <sup>(1)</sup>	1.09	0.17	0.27
5		400	1.58	0.23	0.40
6		400	1.13	0.17	0.28
7		400 <sup>(1)</sup>	0.18	0.03	0.04
8		800 <sup>(2)</sup>	0.41	0.05	0.05
9		400	0.72	0.11	0.18
10		63	0.00	0.00	0.00
11		126 <sup>(3)</sup>	0.00	0.00	0.00
13		400	0.71	0.11	0.18
15		800 <sup>(2)</sup>	0.48	0.07	0.06
16		400	0.40	0.06	0.10
12	II	63	0.12	0.02	0.19
14		126 <sup>(3)</sup>	0.13	0.02	0.10

1) In 2 doses, each of 200 c.c.

2) » 2 » » » 400 »

3) » 2 » » » 63 »

The above figures show that only a small quantity of the alcohol given passes into the milk, and that the animals at last got accustomed to the alcohol and that always smaller quantities of it passed into the milk. Even with quantities reaching 400 c.c. in one dose and 800 c.c. in two doses, corresponding respectively to 0.8 and 1.6 per thousand of the weight of the animal, only from 0.05 to 0.4 per cent. of the amount given passed into the milk. As the distiller's wash usually given by farmers does not contain more than 0.1 to 0.3 per cent. of alcohol, it may be assumed on the strength of these experiments that feeding distiller's wash presents no danger to the life and development of the sucking calves.

The writers have further experimented upon human milk and have found that after a moderate use of alcohol only small and harmless quantities of it pass into the milk.

- 956 - **Experiments on Carnivora on the Economy of the Nitrogen of Food caused by Certain Salts, especially by Sodium Acetate.** - PESCHECK, ERNST in *Biochemische Zeitschrift*, Vol. 52, Parts 3 and 4, pp. 275-330. Berlin, June 30, 1913.

The writer begins by summarizing the results of his previous studies on the subject, as well as the researches of Voltz, Grafe, Abderhalden and others on the action of several salts on the retention of nitrogen in the animal body. He also communicates the results of his recent investigations on the action of ammonium and sodium salts on the metabolism in dogs. The writer finds, as Abderhalden had found, that sodium acetate added to a certain ration reduces the exchange of nitrogen and especially the excretion of nitrogen in the urine. The same effects were produced by sodium citrate, sodium lactate, magnesium acetate, and ammonium salts. Sodium acetate often had a more energetic action in saving nitrogen than ammonium acetate, for which reason the writer cannot agree with several investigators who consider that ammonium salts and nitrogen free foods form complicated chemical compounds in the bodies of animals which can be utilised in building up its proteins.

According to the experiments of the writer it appears that it is the metal and not the acid radical which causes the action of the salts in hindering the elimination of nitrogen. In a future number the writer proposes to publish the results of experiments which he has conducted on herbivorous animals.

FEEDS AND  
FEEDING

- 957 - **Acorns and Beechnuts as Food for Stock** (1). — ENGELS, O. (Report from the Speyer Agricultural Experiment Station) in *Die landwirtschaftlichen Versuchs-Stationen*, Vol. LXXXII, Part 1-2, pp. 93-148. Berlin, June 1913.

The writer divides his article into two parts, dealing respectively with acorns and beechnuts.

I. Some general information is given on the distribution of the chief species of oak.

Coming to acorns, the writer gives the results of analyses made by certain investigators, as well as his own, made on samples from various parts of the Palatinate. The determinations were made according to the methods approved by the "Verband landwirtschaftlicher Versuchs-Stationen im deutschen Reich" (Union of German Agricultural Experiment Stations). Crude fibre was determined according to J. König's method.

Analyses of six samples of air-dried acorns gave the following results :

(1) For the use of acorns for feeding stock, see No. 3190, *B. Nov.-Dec. 1911*; No. 689, *B. April 1912*. (Ed.).

<i>Kernels:</i>		per cent.	
Moisture . . . . .	36.02	—	46.63
Crude protein . . . . .	3.49	—	4.11
Ether extract (fat) . . . . .	1.68	—	2.57
N-free extract. . . . .	44.58	—	53.21
Crude fibre . . . . .	2.00	—	2.94
Ash . . . . .	1.54	—	1.84
<i>Hulls :</i>			
Moisture. . . . .	25.75	—	36.25
Crude protein. . . . .	1.94	—	2.73
Ether extract (fat) . . . . .	0.49	—	1.76
N-free extract. . . . .	29.98	—	39.94
Crude fibre. . . . .	26.84	—	33.49
Ash. . . . .	1.50	—	1.79
<i>Whole acorns :</i>			
Moisture . . . . .	34.57	—	44.82
Crude protein . . . . .	2.27	—	3.91
Ether extract (fat) . . . . .	1.62	—	2.42
N-free extract . . . . .	43.09	—	50.86
Crude fibre . . . . .	5.73	—	7.26
Ash . . . . .	1.53	—	1.78

Further investigations were made on the components of acorns. They form a food poor in protein, but yet of considerable nutritive value owing to their high content of carbohydrates, and also very digestible. The characteristic components are tannic acid and a bitter principle, quercine. These two bodies may give rise to digestive troubles, particularly constipation, if acorns are fed in large quantities. If the acorns are spoiled or musty, they may be dangerous; they should therefore be kept as carefully as possible. Freshness is the best guarantee of their feeding value.

Next to game, pigs make the best use of acorns; sheep and goats also take them occasionally. In Southern Hungary and Slavonia (1) the pigs are driven into the oak woods, where they pick up the acorns and can thus be fattened for slaughter, as they also eat various plants, fungi, etc., which supply them with the mineral matter (phosphoric acid and lime) which is rather lacking in acorns. If the pigs are fed in sties, they should be given small quantities, especially to begin with, not more than 2 to 3 lbs. per head per day; the ration should be made up by green food, nitrogenous food and plenty of water. Under these conditions, acorn feeding produces excellent bacon, but without care the results may be anything but good. Acorns are best fed to pigs crushed and mixed with the other food. When given with laxative food they have a strong binding effect. It is a good thing to spread some in paddocks where pigs are running.

Goats and sheep may be given small quantities of acorns; fattening bullocks may get up to 6 lbs. per 1000 lbs. live-weight, but they must be fed with plenty of green stuff, such as beet leaves and slices, as well as roots

(1) Also in Italy, Spain, Portugal, etc.

(Ed.).

and concentrated nitrogenous food (bran, etc.). For dairy cows and horses, the bitter principle must be removed, or they should be cooked; and they must always be fed in moderation and gradually.

It is always safer to use dried and hulled acorns, as the hulls (which make about 15 per cent. of the total weight), have a very low nutritive value and contain the bulk of the injurious substances.

Dried and hulled acorns, even at about 7s 6d a cwt., may be considered a useful and fairly cheap food. There is no doubt that thousands of pounds' worth are lost to German agricultural economy in the woods each year.

II. Beechnuts may well be used for feeding pigs and sheep, though so far such use is limited. The writer gives information on the distribution of beech, especially in Germany; he discusses the conditions of temperature, moisture and soil necessary for it, and describes its botanical characters. He then goes on to the chemical composition of the nuts, giving the analyses made by several investigators (Boussingault, Schädler, König), and his own results from the analysis of samples from the Forest Office of Kandel-Stüd. These figures are as follows:

<i>Kernels :</i>	%
Moisture . . . . .	14.04
Crude protein . . . . .	24.52
Ether extract (fat) . . . . .	36.31
N-free extract . . . . .	11.24
Crude fibre . . . . .	9.59
Ash . . . . .	4.30
 <i>Hulls :</i>	
Moisture . . . . .	20.51
Crude protein . . . . .	3.36
Ether extract (fat) . . . . .	0.91
N-free extract . . . . .	32.74
Crude fibre . . . . .	37.49
Ash . . . . .	2.64
 <i>Whole nuts :</i>	
Moisture . . . . .	16.25
Crude protein . . . . .	17.25
Ether extract (fat) . . . . .	24.16
N-free extract . . . . .	19.47
Crude fibre . . . . .	19.15
Ash . . . . .	3.72

Besides the general chemical analysis, more detailed investigation of the composition was made.

The nutritive content of beechnuts is high, and their digestibility is excellent, especially when they are hulled. Feeding trials have shown that a certain quantity of beechnuts can well be fed to stock. The writer recommends that they should not be given to horses, as they may be harmful. A report by Pusch in the *Berliner Tierärztliche Wochenschrift* mentions that horses are specially susceptible to the action of a poisonous compound,

fagine, occurring in beechnuts. Experiments in France have, however, shown that horses may be given up to 6 ½ lbs. daily of beechnuts without ill effects. No bad effects are shown by cattle, sheep, pigs, rabbits or poultry on moderate rations of beechnuts.

The chief use of beechnuts is for fattening pigs in the woods; here also, it should be remembered that heavy feeding on these nuts requires plenty of drinking water.

The writer recommends that beechnuts should be hulled; this can easily be done in ordinary mills. Keeping the nuts requires special care; the best method is to spread them out on a floor in a thin layer and turn them every day so that they keep on sweating; otherwise they very easily go mouldy and various poisonous decomposition products form in them. If they spoil in spite of these precautions, they must be cooked before feeding.

To collect the fallen beechnuts, the simplest way is to sweep them up into heaps and clean them by winnowing. The drying may be hastened by putting them in layers on screens in a heated room. They should be collected in dry weather, as otherwise the hulling will give trouble.

Although beechnuts are not equal to acorns, yet when properly used they form a food not to be despised.

958 — **Castration in Relation to the Secondary Sexual Characters of Brown Leghorns.** GOODALE, H. D. in *The American Naturalist*, Vol. XLVII, No. 555, pp. 159-169. New York, March 1913.

BREEDING

After a brief introduction in which mention is made of cases of sexual reversion in individuals belonging to species of birds possessing marked sexual dimorphism, and which cases were accompanied by lesions of the ovaries in the females and castration of the males, especially in domestic breeds, the writer sets forth the reasons which induced him to select Brown Leghorns for his experiments, namely their adult plumage, which is strongly sexually dimorphic, and is practically identical with that of the Jungle fowl; the size of the comb of the female; and the fact that there are at least three distinct stages in the development of the young birds' plumage before the adult colour is reached. The first two stages do not exhibit sexual dimorphism, nor are they identical with that of the adult female. Sexual dimorphism appears first in the third juvenile plumage.

The writer describes and collects in tables comparative statements of the chief secondary sexual characters common to all varieties of domestic chickens and those special to Brown Leghorns. He examines minutely these characters. He then reports the results of his experiments. The chickens — male and female — were castrated when they were 21 to 28 days old, that is, much younger than in the case of commercial caponization. Seven of the castrated males reached the age of four months, then three were killed. The autopsies showed an entire absence of testicular material in two cases. The third had a tiny nodule, possibly testicular. All four survivors were kept until they were 16 months of age.

Two were then killed for study. They developed the normal plumage of the male, and were it not for the small comb and wattles they

would have had nearly the same appearance as a normal cock. They are, however, somewhat fuller plumaged and rather heavier looking birds than a normal cock. They are less active in their movements, are non-combatants and show no sexual instincts. They have never been heard crowing. One of these capons had much the same appearance as a normal cock, he had a large comb but did not crow; at one time he showed some inclination to pay attention to the hens, but it never went as far as an attempt at copulation. At the autopsy it was found that there had been an autoplasmic transplantation of a bit of the testis.

It will have been observed from the foregoing description, that the small comb of these capons is the only character which might be considered female. In all other points the characters are those of the cock, sometimes exaggerated (feather length), sometimes infantile (crowing instinct).

As for the lesser development of the comb, it may be affected by so many conditions that the question as to whether or not the capon has a female type of comb is not easily answered.

Of the hens which were castrated, only one of the females from which the ovary (only the left, since it was assumed that the right had completely degenerated) was removed, reached maturity. There is no doubt as to the effect of ovariectomy on this individual, which passed as a cock with those unacquainted with its history. Nevertheless the assumption of male characters has not been quite complete. First the presence of feathers on the back which are very much hen-like. Second the wing bow is poorly developed. In behaviour the bird showed lack of the crowing instinct, non-combateness and general indifference to the hens. In another castrated female which died at the age of four months, when the first feathers of the third stage began to appear, they were like those of the young male. The later feathers, however, were those of the normal female, owing to the regeneration of the ovary as was found at the autopsy.

These experiments then indicate clearly that while the female Brown Leghorns may assume male characters following the removal of the ovary, the male assumes no positive female characters after removal of the testes.

The writer closes his paper with some considerations of a theoretical nature on the results and on the value of his experiments.

959 - **Breeding-Experiments with Ducks.** — GOLDSCHMIDT, R. in *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*, Vol. IX, Part 3, pp. 161-191. Berlin, April 1913.

The writer has been led to publish the results of his experiments by the appearance of two articles by Phillips and Goodale on the same subject. He has used a number of different races and crosses. He has come to the conclusion, already reached by Phillips for total body development, that stature is to be considered a Mendelian character. But whether it is a

simple or a complex one is not yet known. The writer's experiments were limited to two generations of descendants.

The article is accompanied by four diagrams and numerous tables.

960. — **A Kansas Calf-Wintering Test.** — *The Breeder's Gazette*, Vol. LXIII, No. 20, p. 1164. Chicago, May 14, 1913.

CATTLE

At the Kansas Agricultural College on May 2 was held a most successful meeting of cattlemen, of whom upwards of 500 were present.

President W. J. Waters gave an illustrated lecture on "How a Steer grows". This lecture was followed by a judging demonstration given by Dr. C. W. McCampbell. Prof. W. A. Cochel presented the results secured in feeding silage to fattening cattle and C. M. Vestal presented the results of the winter feeding experiment in the maintenance of calves.

With the present prices of beef there is an incentive to carry the calves through the winter in better condition than ever before; the experimental work was therefore confined to economical methods of wintering beef calves.

Early in January, 50 high grade Hereford calves were purchased at \$ 32 per head. They were shipped to Manhattan and held a few days in order to overcome the effects of shipping and to fill up well before the experimental work was inaugurated.

Taking into consideration all the expenses incurred they cost \$ 7.80 per cwt. at the beginning of the test on Jan. 21. They were divided into five equal lots and fed as follows:

Lot 1, corn silage according to appetite and 1 lb. cottonseed meal per head daily. Lot 2, kafir silage according to appetite and 1 lb. of cottonseed meal per head daily. Lot 3, sweet sorghum silage according to appetite and 1 lb. of cottonseed meal per head daily. Lot 4, corn silage and alfalfa hay both according to appetite. Lot 5, alfalfa hay as fed to Lot 4 and shelled corn equivalent to the corn in the silage fed to Lot 4, with corn stover according to appetite. The only difference in the feeding of Lots 1, 2 and 3 was that the silage was made from different crops, such as corn, kafir and sweet sorghum; of Lots 1 and 4 that the protein feed was from different sources: cottonseed meal and alfalfa hay; of Lots 4 and 5 that the corn was fed as silage in one lot and dry forage in the other.

The results indicate that there is less difference between silage from different sources as a feed than there is in the yield per acre of the different crops. Under local conditions sweet sorghum will produce the largest yield of silage, followed by kafir and corn in the order named. The results secured in the test indicate that the ten calves in the first three Lots could be wintered for 100 days on slightly less than 1 1/2 acres of silage with an outlay of \$ 14 for cottonseed meal. In Lot 4, where alfalfa hay and silage were used, less than an acre of alfalfa and

approximately an acre of silage were necessary to carry ten calves for the same period, and in Lot 5, an acre of alfalfa, an acre of corn and stover combined and two of stover alone were required to secure the same result. The value of the silage is thus shown in that it increases the live stock carrying capacity of the farm.

In giving values to the various feeds used, the local price or cost was charged with a sufficient increase to account for the cost of feeding. The important fact of the tests is that when all feeds were used at prices which are decidedly remunerative to the grower, gains were made at an average cost only slightly more than 3 ½ cents per pound. Another fact of almost equal importance is that calves could be purchased at £ 32 per head or \$ 7.80 per hundred and fed on the coarsest feeds produced on the farm and yet return an average of \$ 5 per head above the cost of feed and labour. The final estimates were based upon feed lot values of \$ 7.50 to \$ 7.60 per cwt. The entire lot was taken to graze on a ranch during the summer and their further development will be followed in order to secure information on the influence of the winter rations.

961 - **Cattle Raising in Jamaica.** ROBERTSON, T. G. M. in *Bulletin of the Department of Agriculture of Jamaica*, Vol. II, No. 6, pp. 155-158. Hope, Kingston, Jamaica, January 1913.

The writer, referring to the experiments made by Mr. Gosset at Belvidere with Indian and Porto Rico cattle, gives the results of the researches which he has himself carried out at Burnt Ground.

Mr. Robertson considers it necessary to produce a type of cattle in Jamaica which will, as far as possible, combine the size, development and hardiness of Indian cattle with early maturity and an aptitude to fatten well. It should, however, not be forgotten that Jamaica is a tropical country with a tropical climate, and that the first consideration is to prevent calf mortality. Good results were obtained by the writer, who used cows with a considerable amount of Indian blood, and half-bred Devon, Hereford and Short-horn bulls.

#### SHEEP

962 - **Wool Production in French West Africa and the Introduction of Merinos.** — DE GIRONCOURT, G. in *Bulletin mensuel de la Société de Géographie commerciale de Paris*, Vol. XXXV, No. 4, pp. 225-239. Paris, April 1913.

The development of the world production of wool does not seem to keep pace with the demand; the Tunisian supply, for instance, is decreasing, and the Argentine stock, an important factor in the market, seems also to be diminishing. This state of affairs has led to the idea of utilizing vast pastoral districts in French West Africa for wool production. Sheep occur throughout Africa, and can withstand more severe climatic conditions than the hardiest zebu. But in the equatorial regions the various breeds have lost many of their primitive characters, especially that of producing wool. The hair of the Central African breeds is unsuitable for weaving; indeed at first sight, they do not seem to differ much from the goats found in the same latitudes.

In the French Soudan, however, chiefly between Djenné and Lake Faguibine, there is a race of woolled sheep, known as the "Macina", which has encouraged hopes for wool production. The fleeces are used in the neighbourhood and the natives of the Niger weave blankets of unbleached wool; these are sometimes quite artistically covered with designs in spots, and fetch 2s 6d to 20s according to quality; the inhabitants wear them on cold winter days, when the thermometer may fall as low as 6° C. (43° F.), at any rate at Lake Debo. A trial of exportation of this wool has been begun and in 1912 the Mopti trading stations sent 200 tons to France and those from Djenné 20 tons. Unfortunately this wool was found to be of such poor quality that it could only be used for mattresses, as the machines could not deal with it owing to its being nearly all coarse hair. Its price on the Niger was £20 to £24 ton, and in Europe £60. These sheep, which were presumably introduced by shepherds from the north and are probably the degenerated descendants of Libyan flocks, are by no means uniform in type; they are a mixture of woolled and non-woolled sheep, and the constant crossing tends to further mix the fleeces.

The Government of Upper Senegal and the Niger has issued a decree to bring about the separation of the woolled and non-woolled sheep; this decree has had some influence, in spite of the difficulties due to the migratory life of the flocks, which travel between the semi-desert Sahelian zone and the lacustrine zone of the Middle Niger. The latter zone, subject to floods from the river, contains enormous reserves of pasturage (*Panicum bougou*) available for several months in the year; its area is some seven million acres, that is about three times the area flooded by the Nile in Egypt. It should allow of a great increase in the number of sheep and cattle: it is therefore natural to think of increasing the breeding of the woolled Macina sheep, which may be practised also throughout the Sahelian zone, especially in the Fonta-Djallon and the Mossi.

For the improvement of the wool of this breed, the Government of the Upper Senegal and Niger started in 1907 the sheep-farm of Niafunké, between Lake Debo and Timbuktu. In 1908 an unfortunate importation was made: eight rams, four Southdowns and four Rambouillet Merinos from Patagonia, died the following year; next seventeen rams, Algerian, Fine-tailed Barbary and Barbary Merino, were brought from the province of Oran; in 1910 eight more Barbary Merino rams arrived; in 1911, eighty more were brought: Crau Merinos crossed by Barbaries, and Barbaries from Sétif. In November 1912, the flock numbered 101 Algerian sheep, 283 indigenous, 660 half-breds, and 141 three-quarter-breds. The weight of the half bred fleece was 2  $\frac{3}{4}$  lbs., while the indigenous sheep give not much over a pound. However, the efforts of a model sheepfarm to improve the produce of the whole country cannot give anything but slow results.

The Chamber of Commerce of Tourcoing, wishing to obtain precise information on the future of the wool-trade in French West Africa, has appointed a Special Commission with M. Henri Dewarin as secretary.

Considering the good results obtained in British East Africa by the continued introduction of Merino rams and ewes from Australia, the Commission

believes that the best means of promoting improvement in the production of wool will be to purchase pure Merinos in Australia and keep them at the station in French West Africa as a pure breed, or as crosses with the native sheep.

The writer, who has been consulted by the Tourcoing Chamber of Commerce, thinks that before the Government of the Colony and private persons embark on the expense necessary for an experiment of this sort, it would be well to make a preliminary study in British East Africa and northern Australia, to find out what are the extreme conditions under which woolled sheep can be successfully kept, especially as regards climate and parasites. It is only after most careful enquiry that the acclimatization of fine-woolled Merinos should be attempted under conditions so unfavourable as those of the Soudan.

963 — **Fat Lambs at Ruakura.** — MC CONNELL, PRIMROSE in *The Journal of Agriculture of the New Zealand Department of Agriculture, Industries and Commerce*, Vol. VI, No. 3, pp. 271-273. Wellington, March 13, 1913.

On the 1st of February 1912, 600 Lincoln Romney full mouthed ewes were put to the rams, half to Border Leicesters, and half to Southdowns, at the rate of fifty ewes per ram.

The ewes were then kept in one flock and were constantly removed from paddock to paddock, this accounting for their fine condition when the lambing season commenced. From a week previous to lambing they received a full ration of mangolds and this was the means of keeping up a good flow of milk. The lambs were sold to local butchers having been fed up to the time of being sold in a paddock of rape.

The number of Border Leicester crosses that were sold was 308, and taking into account the value of the ewe's wool, the gross profit realized from each ewe was £ 1 1s 10d.

The Southdown crosses sold were 372 and the gross profit per ewe — including the wool — was £ 1 4s 10d.

The economical results were thus more favourable for the Southdown crosses which give a superior carcase and come earlier to maturity.

As for weight though the Border Leicester crosses seem somewhat better.

This season the experiment will be continued on 800 ewes, half being put to the Southdown rams and half to the Border Leicester.

PIGS

964 — **The Utilization of Skimmed Milk and Potatoes by Feeding to Pigs.** — HANSEN in *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, Year 20, No. 13, pp. 264-268. Berlin, July 1, 1913.

The writer, after pointing out the progress that has been made in Germany in the fattening of pigs, thanks to the introduction of English blood in the breeds and to the better way of feeding, describes some new foods and then turns to the practices of pig feeding that have long been current in the north west of Germany. This practice consists in setting the pigs at the age of 10 weeks on a feed composed exclusively of barley and meat and fish meal (a mixture of equal parts of each) upon

which at the age of 20 to 24 weeks they reach the weight of 237 to 242 lb. and are ripe for the butcher. For every 100 lbs of live weight at the beginning of this treatment an average of 3.4 lb. of starch value and 0.87 lb. of protein are given, towards the end 2.5 lb. and 0.85 lb. respectively. The daily gains in weight amounted according to the calculations of Prof. Lehmann of Göttingen to about 1.32 lb. per head. The writer is of opinion that this way of producing pork would not be advisable for the East of Germany where it would imply a limitation of hoed crops, a one-sided development of farms, a greater dependence upon foreign food markets as well as a diminished utilisation of skimmed milk and of potatoes. Potatoes and skimmed milk at present yield the highest profit when they are transformed into pork. Experiments conducted by the writer at the Agricultural Institute at Königsberg show that 2s 3 ½d are realized per cwt (112 lbs.) of potatoes when the daily gain is 1 lb. 7 oz and the price of pigs is £ 2 5s 9 ½d per cwt. In this calculation the barley that is fed is valued at 7s 11 ½d and the meat and fish meal at 10s 10 ¼d, while the general expenses at set down at 12s 8 ¾d per head. When therefore unsorted potatoes cannot be sold at the farm at 2s or 2s 6d per cwt. it is more profitable to feed them to pigs. One gallon of skimmed milk when fed with potatoes, barley and flesh and fish meal realizes 1.81d per gallon, and in favourable cases as much as 2.14d per gal. In view of these results it is advantageous to base pig feeding in the East of Germany on the utilization of the potatoes and dairy by-products of the farm. For the carrying out of this plan of feeding the writer has calculated tables of rations.

965 - **Ostrich-Farming in German West-Africa.** - BERTHOLD H. in *Deutsche Kolonial Zeitung*, Nos. 22-23, pp. 360-362 and 380-382, Berlin, May 31 and June 7, 1913.

POULTRY

The live stock industry is becoming important in German West Africa, and includes cattle, horses, sheep, and goats.

To this list should now be added ostrich farming which is a very remunerative undertaking. The latter industry is of recent growth, for in the 1912 census, only 1300 birds are recorded, and the exports of feathers in 1911 were to a value of £3 960 while those of the Union of South Africa in 1912 attained the value of £2 580 000.

As wild ostriches are very abundant in German West Africa, and may be used for out-crosses, there is no danger of the domesticated birds degenerating from prolonged in and in breeding. Moreover the district has no winter rains which prove so fatal to young birds, especially those hatched late in the season (up to November).

On the other hand suitable fodder plants are lacking, therefore irrigation works must be undertaken to be followed by the sowing of lucerne, the principal fodder crop, and the erection of fences to divide the land into paddocks and to prevent the male birds from fighting. The writer recommends that ostrich farming should be combined with some other class of farming, more especially sheep farming.

The Government of German West Africa have acquired a few domesticated ostriches from Cape Colony with a view to forming a stud at the model farm of Otfituesu where birds will be raised to be eventually used for crossing with the captured wild birds.

Ostrich hunting has been prohibited on German territory.

BEES

966 - Consumption of a Hive of Bees during the Year. — HOMMELL, R. in *La Vie agricole et rurale*, Year 2, No. 22, pp. 653-655. Paris, May 2, 1913.

The reasons for the consumption of food in a hive of bees are as follows:

- 1) maintenance of the life and activity of the bees, in the hive and outside ;
- 2) feeding of the brood; 3) secretion of wax ; 4) feeding of the drones.

The daily consumption of a bee varies from 0.003 gm. to 0.12 gm., according to the conditions of life, with a fairly general mean of 0.03 gm. The total food consumed by a worker larva in its feeding period is 0.4 gm ; the daily consumption of a drone is 0.04 to 0.05 gm.

With these data one may attempt the calculation of the total consumption during the year, taking a strong swarm in a large box hive, in a district where there is one great honey period lasting a month ; the different phases of activity and consumption may be summed up as follows :

Period	Average population of the hive	Workers at work:						Total consumption
		in the hive			collecting honey and wax			
		Number	Consumption:		Number	Consumption:		
			per bee per day	total for the period		per bee per day	total for the period	
			gm.	kg.		gm.	kg.	kg.
February . . . .	20 000	20 000	0.006	3.6	—	—	—	3.6
March-April. . .	40 000	30 000	0.03	54.0	10 000	0.06	36	90.0
May . . . . .	60 000	40 000	0.04	48.0	20 000	0.06	36	84.0
June . . . . .	80 000	40 000	0.06	72.0	40 000	0.12	144	216.0
July-August. . .	60 000	40 000	0.04	96.0	20 000	0.06	72	168.0
Sept.-Oct. . . .	40 000	40 000	0.03	72.0	—	—	—	72.0
Nov.-Dec.-Jan. .	30 000	30 000	0.006	16.2	—	—	—	16.2
Totale . . .								649.8

For calculating the consumption of the drones, one may reckon 1500 in a strong hive, and the time during which they occur is about two months, separated into two or more periods by intervals during which there are none.

Taking Godon's figure of 30 gms. (just over 1 oz) for the daily consumption of 1000 drones, it is found that the 1500 consume in two months 2.7 kg. (6 lbs.). This will give a total of 650 kg. (1430 lbs) in round figures, for the maintenance of the life of the hive. But this amount does not represent finished honey as it is taken from the hive, but a nectar-like substance containing 75 or 80 per cent. of water; this would give 182 kg. (400 lbs) of honey. To this amount must be added the food required by the brood.

The bee-population renews itself four times in the year; but this replacement does not extend to the whole 80 000; taking it on 60 000 only, we get 240 000 larvae to be reared. Each larva requires a minimum of 0.5 gm. of bee's bread, making a total of 96 kg. (211 lbs.); reckoning that this consists of one-third each water, pollen and honey, the honey consumption for the brood is 32 kg. (70 lbs).

There remains the secretion of wax. With all the frames moveable the bees get back all the section emptied by the extractor, or failing them waxed sections ready for them to build upon; but M. de Layens' experiments show that it is better to let them build about five sections of 15 sq. ins. each containing a total of 660 gms (1 ½ lb). of wax. This amount is produced economically and without diminution of the yield of honey, but at the same time it means about 7 lbs. of food per pound of wax, or for the 1 ½ lb., about 10 lbs.

These estimations put together are as follows;

Maintenance of the bees . . . . .	400 lbs.
Feeding of the brood . . . . .	70 "
Wax production . . . . .	10 "
Total . . . . .	480 lbs.

Although this figure seems large, the writer considers it is probably too small really; he points out that bees work much more to live than to save, as if the hive under consideration gives an average of 45 lbs. of honey it needs more than ten times that amount of food to produce it.

**967 - Silkworm Rearing in Tropical Countries.** — FAUCHÈRE, E. *Le ver à soie.* — *Bulletin économique de Madagascar et Dépendances*, Year 13, No. 1, pp. 92 III. Antananarivo 1st quarter 1913.

SILKWORMS

The writer believes that the information collected by him, based on experience in Madagascar will be of general bearing for tropical countries.

It is generally believed in Europe that the monovoltine and polyvoltine silkworms belong to quite different races. But experiments on one race reared in different climates allow the conclusion to be drawn that any particular race may be both monovoltine and polyvoltine. If silkworms from Southern Europe of annual or monovoltine races are taken to a tropical climate, they eventually adapt themselves to the new conditions of life, becoming polyvoltine. This has happened with all the annual races introduced into Madagascar, as well as to Guatemala and other parts of Central America. It is well known that atmospheric conditions exercise a great influence on the quality and quantity of silk; but

this is not sufficiently considered when it is stated that a race which has become polyvoltine is degenerate and will inevitably give inferior silk. The truth is that these polyvoltine races are kept in countries in which the climatic conditions are not suitable, and are always reared by natives who are by no means careful or expert.

The results obtained in Central Madagascar and at Réunion show that European silkworms, when acclimatized to the new conditions and changed to the polyvoltine state, continue to produce a silk equal in quantity and quality to that obtained in France.

It seems to the writer that the silkworm should be considered as an insect of tropical climates (constant temperature), and the monovoltine state as an artificial one produced by the rearers to adapt it to the European climate (variable temperature). Observations of practical breeding allow one to state that very hot and moist climates of the equatorial and tropical zones do not allow the production of silk of first quality. But the climate of Central Madagascar, as well as that of the high parts of Réunion, seems to suit the silkworm admirably. Further, practical observations have shown that moistness of the atmosphere, which is so harmful in countries with a variable temperature, has no bad effects in tropical countries, unless it remains near saturation point for several days in succession.

The production of silk from *Bombyx mori* can be undertaken in all very hot, and even very moist, tropical countries, but first-class cocoons can only be expected in mountainous parts, where the temperature is not very high, insolation is intense, and winds are frequent, all of which conditions occur in Central Madagascar: . . .

*Number and period of the rearings.* — In this district the silkworm moth has five generations per year; but one of them, occurring in the cold season, cannot be used for industrial rearing. From the hatching of the caterpillars to the collecting of the cocoons about 45 days elapse, so that if eggs ready to hatch were to be had, at least six crops of cocoons could be got in the season, lasting from the middle of September to the middle of May. From the middle of September to the end of November the silkworms do splendidly; December is generally very rainy, so it is better to arrange not to rear any worms during this period.

*Nurseries.* — There is so far no general agreement as to the type of nursery best suited for tropical countries. It has been asserted that nurseries built on the European plan, with plenty of openings to ensure continuous and thorough ventilation, are unsuitable for the conditions in Indo-China; in Madagascar, however, the silkworms give better results the more thoroughly the nurseries are ventilated. They may be made of sun-baked or unbaked bricks, with tiled or thatched roof; it is better to raise the ground-level a little to keep out moisture, and to make a flooring, which may be simply of well-beaten clay. The advisability of making a ceiling is indisputable; but all the same many European rearers in Central Madagascar get good results without.

The arrangements for aspect of the rooms, lighting and disinfection and inside treatment of the nurseries are the same as for silkworm rearing in Europe.

The temperature at Antananarivo during the rearing season (mid-Sept. to mid-May) varies between 18° and 25° C (64° and 77° F.); there is therefore no urgent need for heating; but still, to avoid prolonging the first and last rearings beyond 37 or 38 days, it is as well not to let the temperature fall below 19 or 20° C (66 or 68° F.). In the higher parts heating must go on till the middle of November, and even during hibernation to prevent dampness.

*Feeding.* — In Europe it is said that the age of the leaves ought to keep pace with the age of the caterpillars; in Madagascar caterpillars in the fourth or fifth stage can manage four-months old leaves quite well. The number of times fresh leaves are given per day varies; the hotter and drier the weather the more often must this be done. When the caterpillars are young they should be fed eight or ten times a day; later six is enough. But in the fifth stage they must be fed so that they are never without leaves. From observations at the Silkworm Station at Nanisana it appears that to rear an ounce of eggs (1) about 1200 lbs. of leaves are required. they must be carefully sorted and cleaned. The weight of leaves eaten during the different stages is as follows :

1st stage . . . . .	0 ½ lbs
2nd " . . . . .	16 "
3rd " . . . . .	61 "
4th " . . . . .	194 "
5th " . . . . .	915 "

*Length of stages.* — In Madagascar the stages are slightly shorter than in Europe, with the exception of the last, which brings the whole larval period to about the same as in France. The following are the figures :

1st stage . . . . .	5-7 days
2nd " . . . . .	4-5 "
3rd " . . . . .	5-6 "
4th " . . . . .	6-7 "
5th " . . . . .	11-13 "

*Killing and drying.* — For killing and drying the cocoons, the various methods used in Europe may be employed ; but in countries in which polyvoltine silkworms are reared and the spinning can go on for six or eight months in the year, machines of smaller capacity can be used than in Europe. It would be possible to make simple machines for hot countries by doing away with the motor and the ventilator, thus realizing a considerable economy. Driers similar to those used for fruit, with circulation of hot air, might be used. In Indo-China a type of drier invented by M. Emery,

(1) Ounce of 25 gms.; the ounce avoirdupois = 28 gms

(Ed.).

simple and easily transportable, is much employed. This drier consists of a little square or rectangular fire-place, above which are arranged small compartments fitting exactly one on top of another. The bottoms of the compartments, on which the cocoons are piled, should be of wire netting; the hot air passes up through the cocoons and at the same time kills them and dries them.

*Diseases and enemies of silkworms.* — Of all the diseases attacking silkworms in Madagascar, the "grasserie", considered very unimportant in Europe, is the worst. Predisposing causes are: lack of ventilation, excessive heat, and in particular the use of too young leaves.

Among the enemies, ants and rats devour both the caterpillars and the cocoons. Further, there is a fly, known as "oudji" in Japan, which oviposits in the caterpillars; the larvae developing within kill the caterpillar before it spins; a caterpillar with only one or two of these larvae in it spins a cocoon with little silk in it, and dies as a chrysalis. This fly is common in the silkworm-rearing parts of Asia; in India it is called the "silkworm fly", in Indo-China "kuji" and "connhang", M. Vieil speaks of another fly, which attacks the caterpillars when they climb up to spin, and whose sting is immediately fatal.

The "landibe" (*Borocera madagascariensis*) is attacked by flies which seem to be related to the "oudji", but so far these have not been recorded from the silkworm nurseries.

## FARM ENGINEERING.

### AGRICULTURAL MACHINERY AND IMPLEMENTS

968. — *The Development of Agricultural Machinery during the last 25 Years.* — FISCHER, G. in *Maschinen-Zeitung*, Year 11, No. 12, pp. 141-150. Berlin, June 15, 1913.

The paper reviews the important progress that has been made in agricultural and auxiliary machinery during the last 25 years. Considerable improvement has been effected in connection with motors driven by heat, and agricultural portable engines have attained, thanks to superheated steam, a degree of perfection which allows a great saving of water and of fuel. Equal improvements have been effected in liquid fuel and electric machines. As for machines for tilling the soil and for preparing forage, the progress has been chiefly in the direction of improving those machines which existed already in a general form 25 years ago.

The writer next examines briefly the work done in connection with dairy machines and lastly the great changes accomplished in the esication of agricultural produce.

969. — *Competition of Machines for Tilling the Soil, at Chulnitsa, Rumania.* — THALLMEYER in *Deutsche Landwirtschaftliche Presse*, Year XI, No. 46, p. 557. Berlin, June 7, 1913.

The following firms took part in this competition, which was held from May 25 to 28: Lenz of Mannheim with his motocultivator built on Köszei's system; Bajac of Liancourt, France, with a cable outfit consist-

ing of a benzin tractor and balance plough, machines which in the competition belonged to different classes. The real plough tractors, with gang ploughs, which took part in the competition tests were the following: Hart-Parr, Caterpillar, Big Four, Twin City and Pioneer, the last two of which were tried for the first time in Europe.

The trial consisted of ploughing 24.7 acres to a depth of 7.08 inches. The American tractors worked with eight-furrow ploughs (Hart-Parr, Big Four, Pioneer), with ten-furrow ploughs (Caterpillar), and with twelve-furrow ploughs (Twin City); Bajac's outfit worked with a three-furrow balance plough. The Chulnitza competition was organized by the syndicate of the Jalomitza district farmers. The ground on which the tests were made was perfectly flat and in the most favorable conditions of moisture. The judges have not published the results of the competition.

970 - **The Competition of French Beet-lifting Machines.** in *Blätter für Zuckerrübenbau*, Year XX, No 10, pp. 146-151, Berlin, May 31, 1913.

This competition was held at Corbeaulieu near Venette (Compiègne) in October 1912. The soil of the field in which the machines were tried was a deep loam. The crop was estimated at 10 to 12 tons per acre.

The firm Bajac of Liancourt presented a lifter for three rows of beets which seemed well built and easy to handle. Each row is lifted by two shares which end in a rounded extremity and which with the forward motion of the machine lift all the earth round the beets. The ground was loosened to a depth of about 5 inches.

While this machine represents a simple beet lifter which, however has given satisfactory results, M. Degrémont, a machine builder of Le Cateau (Cambresis), presents a lifter and topper which lifts the beets, tops them and lays them in little heaps. In order to obtain this result it required two apparatus working, one after the other, on three rows at the same time. The topping machine required 4 oxen, a driver, and a workman.

The lifter and cleaner presented by the same firm is in many respects noteworthy and is provided with several special devices which mark considerable progress in this direction. One advantage is that very few beets are damaged or broken and that the field is not grubbed up but remains in a condition for carting to be carried out, as the apparatus does not penetrate too deeply into the soil.

At the competition several other lifters and cleaners were presented but they were designed only for one row at a time, and this from the point of view of economy and the amortization of the machine is not sufficient.

The Société Anonyme Massart of Liege exhibited a lifter with two shares.

In this competition the most successful firms were Degrémont and Bajac. The experiments yielded abundant results and prove that in France the solution of this problem interesting both to agriculture and to the sugar industry is receiving now much attention.

971 - **The Pilter Tractor.** MANRIN in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, Vol. 119, No. 5, pp. 705-708. Paris May 1913.

The experiments made with this tractor (14 HP) by the Agricultural association of Gien have given the following results :

	{ Heavy Oliver	Cockshutt
Plough used. . . . .	{ Plough (2 wheels, one furrow)	Sulky Plough (3 furrows)
Labour. . . . .	{ 1 Mechanic	1 Mechanic
	{ 1 Labourer	1 Labourer
Depth of furrow. . . . .	9 $\frac{1}{2}$ inches	5 inches
Breadth " . . . . .	13 $\frac{1}{2}$ "	29 $\frac{1}{2}$ inches
Average power, . . . . .	926 lbs.	882 lbs.
Duration of experiment . . . . .	30 Minutes	28 Minutes
Duration of work . . . . .	21 "	24 "
Total area ploughed . . . . .	487 sq. yards	1259 sq. yards
Velocity per second . . . . .	36 $\frac{1}{2}$ inches	38 $\frac{1}{2}$ inches
Work transmitted to plough in H P.	5.18	5.2
Consumption of fuel per HP in gallons.	0.382	0.417
Volume of earth loosened per gallon of fuel.	191 $\frac{1}{4}$ cubic yards	205 cubic yards

972 - **Meyenburg's Motocultivator.** — DE CONDÉ in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, year 112, Vol. 119, No. 5, pp. 699-704. Paris, May 1913.

This is a description and illustration of Meyenburg's motocultivator, the characteristic feature of which is the special construction of the milling teeth. They are of bent steel wire about one-third of an inch in diameter. They are flattened out at one end to a breadth of half an inch. The other end is fastened to a not completely closed ring by means of which they are attached to the shaft.

This machine has given the following results at a trial made at Bourges.

	1st day	2nd day
Breadth of work done . . . . .	6.56 ft.	6.56 ft.
Average depth of do. . . . .	3.9 inches	4.73 inches
Velocity per second . . . . .	6.7 "	6.69 "
Total area worked . . . . .	5022 sq. yards	14. 35 sq. yards
Time required per acre . . . . .	3h. 34 min.	3h. 34 min.
Consumption of benzol per acre . .	9.95 gals.	9.95 gals.
Volume of earth loosened per gallon of benzol . . . . .	51.86 cub. yards	51.86 cub. yards

573. - **Portable Wheat Esiccator.** — HÖLTZERMANN in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 46, pp. 554-555. Berlin, June 7, 1913.

This esiccator, which of late years has spread widely in Russia, gives very good results. The writer with the help of illustrations showing elevations and longitudinal section of the machine describes its construction and *modus operandi* and gives also an estimate of the cost of

working with it. The essiccation is obtained by the direct products of combustion of the fuel contained in a small fire box, which by the suction of a powerful ventilator are obliged to pass through a shallow layer of the grain to be dried. The grain is kept continuously in motion by a very ingenious stirrer. It is driven by a gin, portable or any other power engine.

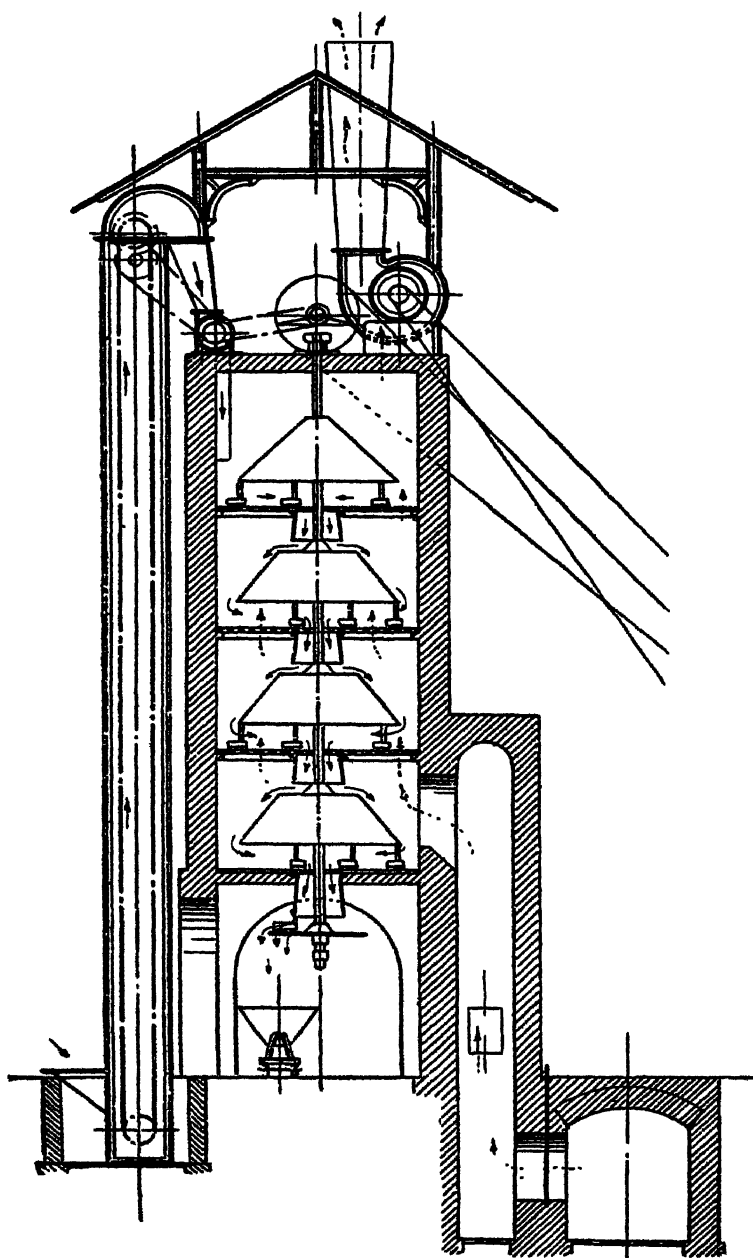
At present the apparatus is built in two sizes which, cost respectively about £ 80 and £ 90.

**974. - Continuous Drying Apparatus for Agricultural Industries.** - DE CONDÉ in *Journal d'Agriculture pratique*, Year 77, Vol. I, No 20, pp. 632-634. Paris, May 15, 1913.

This esiccator consists, as is shown by the annexed figure, of a cylindrical tower divided horizontally by perforated plates. A shaft supports conical distributors over each plate. The heated gases enter at the lower extremity of the tower and rise to the top while the stuff to be dried descends, so that the warmest gas comes into contact with the driest stuff. Heat is generated in the fire place at the foot of the tower and is forced through the apparatus by an exhauster at the top.

In the figure the direction followed by the stuff to be dried is shown by full arrows, that of the heated gases by dotted arrows. The temperature of the gases is regulated by the admission of cold air.

The Huillard esiccator used at the Nag Hamadi (Egypt) sugar mills has given the following results: The weight of the stuff to be dried was 103  $\frac{1}{2}$  tons. The degree of moisture on entering the apparatus was 81.5 per cent. and on leaving it 35 per cent. The weight of the water evaporated was therefore nearly 74 tons. The temperature of the gas at its entry into the tower was 278° C; at its issue 52° C. The power required by the ventilator was 25 HP. and by the drying apparatus 5 HP.



Huillard's esiccator.

975 - Trial of a Groat Mill. — GIESELER in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*. Year 14, No. 23. pp. 392-393. Bonn, June 6, 1913.

The results obtained during the trial of the mill are shown in the following table:

Cereals ground	HP. required	Lbs. ground per HP.	Cost of electricity in pence per cwt.
Barley: coarse . . . . .	3.50	161.0	07.2
medium . . . . .	12.85	89.7	11.9
fine . . . . .	9.10	82.7	13.1
Rye: coarse . . . . .	2.60	176.3	06.6
medium . . . . .	3.80	161.2	07.2
fine . . . . .	5.35	110.4	10.2
Oats: coarse . . . . .	7.80	129.3	08.4
Wheat: fine . . . . .	13.80	144.4	07.2
Maize: fine . . . . .	8.30	112.4	10.2
Peas: fine . . . . .	13.35	164.6	06.6

*General results:* The groat mill size III gave the above results without any trouble or drawbacks. Its management is very simple, its construction is solid and durable and the devices for lubricating are good. It costs 500 Marks (about £ 25).

976 - Apparatus for Smoking Meat etc. — MARTINY. B. in *Mitteilungen des Verbandes landwirtschaftliche Maschinen Prüfungs-Anstalten*, Year 7, Part 1, pp. 1-5. Berlin, 1913.

This apparatus has been submitted to a two years trial at the Halle machine experiment station. It is built entirely of metal; The framework is of angle iron, the walls are of galvanised iron plates, the edges of which are folded over each other and bolted. In the lower part of the apparatus a movable fire box is situated and contains the fuel, sawdust on twigs or wood shavings. By means of some vertical partitions the fire is obliged to follow a serpentine course, and thus lasts longer. Between the fire box and the space in which the meat is hung there is a double bottom of sheet iron enclosing a space in which the smoke is dried, cleaned and distributed. The whole apparatus is set up near a chimney with which it is connected and which carries off the escape smoke. These apparatus are built in various sizes ranging from £2.10s to £12.10s.

The judgement passed upon these apparatus is the following: Weber's smoking apparatus is easy to manage, it does not take up much room, it is durable and safe, it allows of a continuous production of smoke, and gives good uniformly smoked products. It is also suitable for keeping smoked meats. It can therefore be recommended for domestic use both for smoking meat and sausages and for storing the same.

#### 977 - Review of Patents.

##### *Machines for Tilling the Soil.*

- 260 626 (Germany) Disk plough with cable traction.
- 60 016 (Austria) Motor plough.
- 60 203 (Austria) Motor plough.
- 60 015 (Austria) Harrow with rotating implement shafts arranged obliquely to each other and to the direction in which it travels.
- 255 592 (Belgium). Motor plough.
- 1 062 198 (United States). Subsoil plough.
- 1 063 928 (United States). Plough.
- 1 064 149 (United States). Combined Weeder and Cultivator.
- 1 064 038 (United States). Harrow.
- 454 864 (France) Improvement in one or multiple furrow balance plough.
- 454 856 (France) Swing plough with helicoidal mould board.
- 4 576 (England). Motor ploughs.
- 5 558 (England) Harrows and cultivators.
- 130 806, (Italy). Steam outfit for mechanical tilling of the soil.
- 130 871, (Italy). System of ploughing with mould boards having a convex surface turned outwardly.
- 128 529 (Italy). Device for automatically lifting and stopping harrows.
- 60 436 (Switzerland) Motor plough.

##### *Manure distributors*

- 5 484 (England) Manure distributing machine).

##### *Sowing machines.*

- 251 499 (Germany). Sowing machine for beet and similar seeds.
- 60 017, (Austria). Potato laying machine.
- 60 022, (Austria). Drill with sowing wheels inside the hopper.
- 1 062 766, (United States) Seed Planter.

##### *Mowing Machines.*

- 259 463 (Germany). Mowing apparatus for reeds.
- 60 215, (Austria). Mower.
- 1 063 305, (United States). Attachment for mowing machines.
- 454 924 (France). Lawn mower.
- 4 157 (England). Grain harvester and binder.
- 60 250, (Switzerland) Auto-mower.
- 60 437, (Switzerland). Knife for mower.

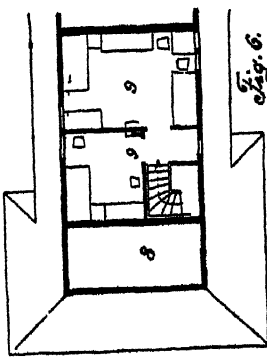
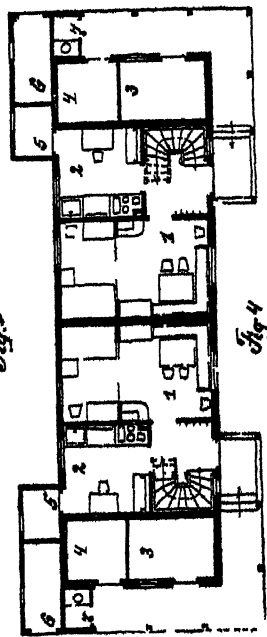
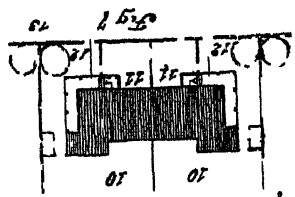
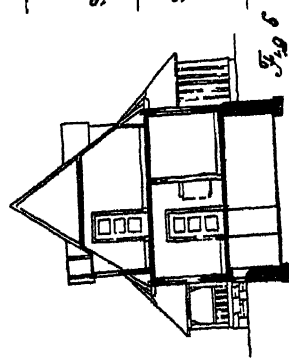
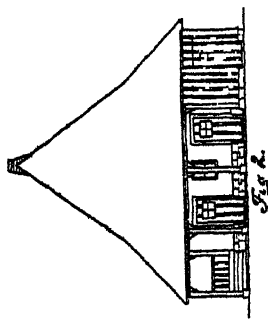
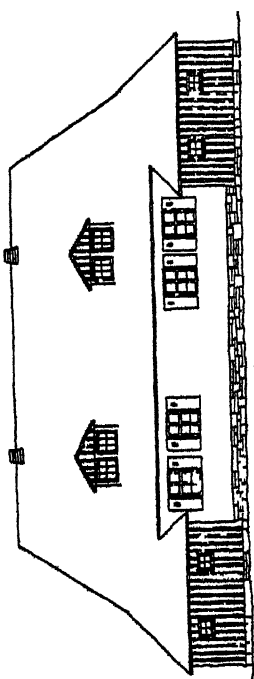
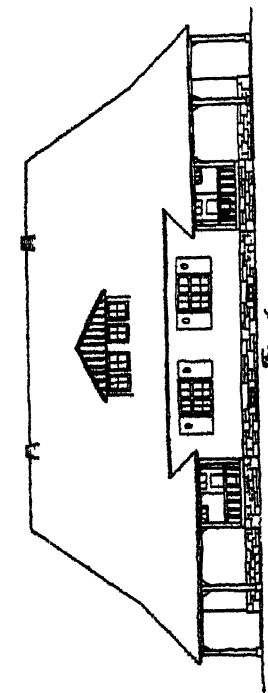
##### *Machines for lifting root crops.*

- 259 388 (Germany). Discharge wheel for potato harvester with oblique running throw wheel.
- 60 223, (Austria). Beet lifting plough.
- 255 501, (Belgium). Potato lifting machine.

##### *Machines for cleaning grain and seeds.*

- 1 063 834, (United States). Threshing machine.
- 4 247 (England). Threshing machine.
- 4 442 (England). Grain separating machine.
- 130 805 (Italy) Cylinder and concave for threshing machine.





Plans, elevations and section of house for two families of farm labourers.

*Other agricultural machines and implements.*

- 259 318 (Germany) Device for pulling the tying material in straw presses (Annex to Pat. 259 317).  
 60 020 (Austria) Coffee cleaning machine.  
 1 063 810 (United States) Grinding mill.  
 1 064 489 (United States) Milking machine).  
 1 064 645 (United States) Cotton chopper.  
 454 964 (France) Apparatus for sulphuring.  
 5 248 (England) Sheep dip.  
 60 251 (Switzerland) Machine for sharpening scythes.

978. - **Prize Designs for Double Dwelling House for Agricultural Labourers.**  
 HÜRRIE, E. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 35, pp. 428-429. Berlin, April 30, 1913.

BUILDING-  
CONSTRUCTION

In the special section of agricultural buildings, of the International Building Exhibition at Leipzig (1913) the designs shown on the annexed plate were awarded the first prize. The plan is very simple (kitchen and dwelling room).

The stables are immediately adjoining the house. Thus, besides other practical advantages, a more compact and effective roof is possible. In front of the door and round the stables the roof is prolonged so as to cover spaces for the pantry, shed and closet; the entrance is also covered so that the closet may be reached under cover. The house is provided with an underground cellar. It is situated a few yards back from the road, leaving space for a small garden and yard enclosed by a hedge along the road. The walls of the cellar are of stone, the others of brick. The heating is so arranged that the heat produced by the kitchen fire can be utilized for warming the dwelling room and the rooms in the roof. The inner fittings of the house are very simple. The cost of such a house is about \$ 170.

In the annexed plate the figures show respectively the front, side and back elevation, also ground plan, cross section, roof story and general plan.

In Fig. 4, (1) is the dwelling room, (2) the kitchen, (3) the goats' stable, (4) the pigsties, (5) and (6) pantry and implement room, (7) the closet. In Fig. 6, (8) is the hay loft and (9) the bedrooms. In Fig. 7, (10) is the field, (11) the garden, (12) the yard and (13) the road.

## RURAL ECONOMICS.

- 979 - **Dairying without Breeding:** Researches on the Nature, Spread and Changes in the Factors of Profit in Dairying without Breeding, with special regard to the Conditions of the Rhine Province and of Westphalia. — WÜSTENDORFER, KURT in *Landwirtschaftliche Jahrbücher*, Vol. 44, Part 4, pp. 529-639. Berlin, May 20, 1913.

RURAL  
ECONOMICS

The writer distinguishes two principal types of dairy farms, those that do not breed, that milk only (reine Abmelkwirtschaft) and those that breed (reine Züchtwirtschaft); Between these two there are intermediate forms. The characteristic difference between the two extreme forms consists in the way the cattle is replaced: by purchase, or by breeding on the farm itself, in the

length of time that the animals stay in the farm, in the way the calves are utilized, and in the kind of feeding. Each form has its pros and its cons. The milking farm requires less, and less careful, work, it favours a rapid turn over of capital, it facilitates the adaptation of the production of milk to the demand, and it allows the most intense utilization of existing buildings, while it furnishes excellent manure due to the consumption of large quantities of concentrates. On the other hand the danger from cattle diseases is very great and a number of good cows that would still be useful for breeding purposes are withdrawn.

As factors of the profitability of the above type of dairy farms, the writer mentions the conditions of labour, of the forage market and of the milch-cow market, the cost of production of milk and its sale price. He discusses the changes in these factors which he has collected in numerous tables from observations made during the last ten years in the Rhine province and in Westphalia, where this kind of dairy farms is fairly numerous.

The wages of day labourers, of farm hands, especially of Swiss stable men have risen considerably. The difficulties with the farm servants and labourers (changes of situation, breach of agreements etc.) have increased considerably on account of the great industrial development of the district.

Concentrated foods have, on the whole, become much dearer, so that the greater cost per cow and per year due to this item amounts to £ 3 15s 6d, as an average of 11 farms. This increase in the cost will be easily understood if one bears in mind that with the two-fold object in view: production of milk and of meat the consumption must be heavy both as to the total nutritive elements and as to the protein contents. Some of these farmers indeed often carry the intensity of feeding beyond the limits of sound economy, so that, as may be seen from these observations, the feeding becomes irrational and the profits of the concern diminish, for here also the law of decreasing returns holds good. In this connection, both in the production of abundant and cheap forage by a better rotation of crops and in the selection of concentrates (with due regard to prices and to special effect) there is room for a good deal of improvement.

For the aims of these milk farms only the best animals of those breeds that combine an abundant yield of milk and an aptitude for fattening are used. But the prices of good milch cows have, during the last decade, with the exception of a few bad years, increased extraordinarily owing to the greater demand, the claims of middlemen and the development in the breeding of pure races. Thus for instance the market prices at Dinslaken and Neuss have risen by an average of £6 5s or 39.7 per cent.

The greater expense thus caused by the purchase of the cows is partly compensated, other conditions being equal, by the increase, especially during late years, in the price of the discarded cows sold to the butcher. (This increase has been, on average, during the ten years between 1901-1911, and at the Cologne, Crefeld, Aix-la-Chapelle, Düsseldorf, Essen and Dortmund markets, of £1 12s per cwt. or 34 per cent. live weight. Nevertheless the "loss per cow" that is the difference between the purchase and the sale price is greater now than it was ten years ago.

Besides the above causes, the modern hygienic requirements also tend to increase the cost of production of milk.

Among the causes which have acted against the increase in the price of milk the writer mentions the extension of the milk trade, due to the progress of technique and to the introduction of a sliding scale tariff for the conveyance of milk by rail, the low cost of the production of milk in breeding districts situated at a distance from industrial centres and the activity of the organizations of the milk trade. Nevertheless, in consequence of the ever increasing demand, and perhaps also of the action of organizations of producers, in reality there has been an increase in the price of milk, to such an extent that no decrease of general and considerable profit is to be apprehended in these farms when situated in suitable localities and making good use of concentrated. On the other hand, the writer considering the lower cost of producing milk and the high value commanded by milk in the breeding farms, considers it possible that the latter have become more profitable and have diminished the power of the milking farms of competing with them.

In selecting between these two types of farms the following factors are the weightiest.

1. The price of milk and the position of the farm as to means of communication.
2. the personality of the manager of the farm.
3. The size of the farm.
4. The quantity and the quality of the available forage, not possessing market value, which is produced by the farm, and of the by products of the agricultural industries.
5. The existing and the possible proportion of meadows and pastures.

In milk farms, without breeding, the amount of labour and of capital required by every head of cattle is considerable, consequently adequate net returns are only possible where the gross returns are also high, that is, where the price of milk is high. This price cannot be determined in general, owing to the very varied economical conditions of the several farms and their positions as to facility of transport.

As for the position of the farm as to means of communication, as a rule, the capacity of a milk farm to stand competition diminishes the further it is located from a market.

The proper management of a milk farm requires a thoroughly capable man; he must know how to value the aptitude of a cow to produce milk and meat, he must be able to hold his own against the dealer and he must understand feeding animals so as to make the best of the condition of the market of concentrated foods. These qualities, with the exception perhaps of the first are generally more often found among the large proprietors than among the small ones. Even in the selling of milk and the buying of cattle, the former enjoy a certain superiority over the latter who are often completely at the mercy of the dealers.

The quantity and the nature of the by products of agricultural industries are of decisive importance in the selection of the type of farm when these foods are to be utilized in one's own farm. The feeding of large quan-

tities of fresh or ensilaged beet root pulp, beet root leaves and rye distiller's wash can easily be more injurious to cows in calf than to milch-cows; and they may sometimes, when no drying apparatus is available induce the manager to turn his farm into a milk farm and in some cases even force him to do so.

Not only the actual, but also the possible proportion of pastures and meadow to arable land must be taken into consideration in selecting the type of farming to be adopted; the climate (amount of rainfall) and the conditions of the soil determine the possibility of laying down pastures which are perhaps already necessary for the success of the partial milk farms (in which the best cows are put to the bull once or twice) and are absolutely indispensable in the partially and wholly breeding farms.

During the last ten years the increase and decrease of the numbers of these two types of farms in the Rhineland and Westphalian industrial districts has been the following: from 1904 to 1907 a great increase of breeding farms took place, without however any diminution in the milk farms, in 1908 there was an increase in the number of milk farms at the expense of the breeding farms; in 1909-1910 the latter diminished both absolutely and relatively, without an absolute increase in the milk farms; in 1911 there was an increase of the former and a decrease of the latter. Whether this decrease is due to economical reasons or to the exceptional character of 1911 will not be conclusively known until the figures for 1912 and 1913 will be available. Should these figures show a further absolute and relative increase in the number of young cattle, it will be demonstrated that the economical limit of the milk farms had been considerably overstepped during the years 1908-1910 and that the economic changes in the forage, cattle and milk markets have induced farmers to change the type of their farm where milk farming was no longer advantageous.

980 - **The Butter Problem.** CARTER PLATTS, W. in *The Field*, Vol. 121, No 3145, pp. 628-683, London, April 5, 1913.

A few years ago, at the cost of £. 1600, Major R. F. Roundell equipped a modern dairy on his estate at West Marton, near Skipton (Yorkshire). It was established not as a profit-making concern for the owner, but for the benefit of his tenant farmers. The books have been open to the writer for the purposes of the above article.

A large portion of the milk, amounting to almost half the total receipts, is sold again as fresh milk and the bulk of the remainder is separated for butter making, there being a good market for the separated milk in the poorer parts of the industrial centres. Cream and cheese are also sold, and all waste products are consumed by pigs.

The milk is bought at 5  $\frac{3}{4}$  d. per gallon in summer and 7  $\frac{1}{2}$  d. per gallon in winter; these prices are low, but there are certain compensating advantages from the farmers's point of view in being able to dispose locally of his total milk produce.

During the last completed working year, 98 636 gallons were received from farmers occupying 1676 acres of grass land. Of this, 44 160 gallons were sold as new milk and 856 galls. were made into cheese; the rest was

separated and produced 3 310  $\frac{1}{2}$  galls. of cream; 2252  $\frac{1}{4}$  galls. of cream were made into 13504 lbs. of butter and 32 837 galls. of separated milk were also sold. The Profit and Loss account for the same period shows the following figures:

	£	s	d
Purchases . . . . .	2865	2	0
Working expenses . . . . .	590	10	4
Depreciation of plant . . . . .	99	9	0
	£ 3555	1	10
Total Receipts . . . . .	£ 3847	16	7 $\frac{1}{2}$

When book debts and values of stocks had been adjusted, a net profit of £188 is 4  $\frac{1}{2}$ d was shown; while half this sum was put into a reserve fund, the remainder was distributed as bonuses amongst the tenant farmers, proving equal to an additional farthing per gall. on the price of the milk they had brought in.

981 - **The Economic Causes of Decreased Milk Production in Austria-Hungary.** — ERLBCK, ALFRED R. in *Milchwirtschaftliches Zentralblatt*, Year 42, Part 11, pp. 338-341. Hannover, June 1, 1913.

The writer attributes the decrease in milk production in Austria-Hungary to the declining interest displayed by farmers in cattle raising consequent upon the great rise in the price of food stuffs, and also to the large outlay of capital required for modern dairy equipment. The same reasons have caused the small holders to abandon the industry, and led to its gradual concentration into the hands of the large producers and in the districts which are more favourably situated as regards means of communication. As a means of increasing milk production the writer recommends the encouragement of cattle breeding, especially with regard to pure bred stock and good milk yields, by means of societies for the control of milch cows, and the adjustment of the price of milk by the agency of town depôts to which the milk can be consigned.

982 - **Intensive Feeding of Milch Cows.** — HÖCKNER. Ist intensive Milchviehfütterung nach Leistung auch in einem Zuchtstalle ohne Schädigung der Zucht durchführbar und rentabel? — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 32, pp. 388-389, No. 33, pp. 403-404, and No. 35, pp. 429-430. Berlin, April 19, 23 and 30, 1913.

Since February 1910, the writer has been practising on his estate of Langenzinne near Freiberg in Saxony the intensive feeding of milch cows according to their performance. The animals were divided into lots and Kellner's system was followed.

In the present article he gives the advantages accruing from this method of feeding his animals, *viz.*: greater regularity in milk production, lengthening of the lactation period, better health and condition, less loss from abortion, reduced mortality among the calves, higher money return per cow, saving in bulky food. In conclusion, the writer gives his expenses and returns according to his cow-keeping books for the years 1909, 1910, 1911 and 1912 (up to October 1): See table pp. 1282-3 (1).

(1) As the results for 1912 deal with only 9 months, we have only given the data for 1909, 1910, and 1911. (Ed)

*Cow-Keeping Expenses.*

1909	1910	1911
<p><b>I. Bulky food.</b></p> <p>a) Winter:</p> <p>6 kg. hay at 5 M. per quintal . . . 0.30 M.          Diatilers wash . . . . . 0.08          13 kg. mangolds at 1.4 M. per q. . . 0.21          5 kg. straw at 3.00 M. . . . . 0.15</p> <p>210 days at 0.74</p> <p>155.40</p> <p>b) Summer:</p> <p>90 kg. clover at 1.40 M. per quintal . . . 0.60 M.          2 kg. straw at 3.2 . . . . . 0.08</p> <p>135 days at 0.68</p> <p>105.40</p>	<p><b>I. Bulky food.</b></p> <p>a) Winter:</p> <p>6 kg. hay at 5 M. per quintal . . . 0.30 M.          Diatilers wash . . . . . 0.08          13 kg. mangolds at 1.4 M. per q. . . 0.21          5 kg. straw at 3.00 M. . . . . 0.15</p> <p>210 days at 0.74</p> <p>155.40</p> <p>b) Summer:</p> <p>90 kg. clover at 1.40 M. per quintal . . . 0.60 M.          2 kg. straw at 3.2 . . . . . 0.08</p> <p>135 days at 0.68</p> <p>105.40</p>	<p><b>I. Bulky food.</b></p> <p>a) Spring:</p> <p>140 days at 0.74 M. . . . . 103.60</p> <p>b) Summer:</p> <p>40 kg. clover at 1.6 M. per q. . . 0.64 M.          3 kg. straw at 4 M. . . . . 0.12</p> <p>135 days at 0.76</p> <p>117.80</p> <p>c) Autumn:</p> <p>4 kg. hay at 8 M. per q. . . . . 0.32 M.          Diatilers wash . . . . . 0.16          8 kg. beets at 3 M. per q. . . . . 0.24          5 kg. straw at 5 M. per q. . . . . 0.25</p> <p>70 days at 0.97</p> <p>67.90</p>
<p><b>2. Concentrated food.</b></p> <p>for 66 cows</p> <p>Wheat bran . . . . . 120.15          Crushed Russian barley . . . . . —          Pea-nut meal . . . . . 58.90          Brewer's grains . . . . . 59.00          Dried sugar beet slices . . . . . 132.50          Dried potato flakes . . . . . 12.90          Best linseed meal . . . . . 219          Sesame meal . . . . . —          Palmnut meal . . . . . —          Maltzena . . . . . —          Cottonseed meal . . . . . —</p> <p>382.85</p> <p>4935</p>	<p><b>2. Concentrated food.</b></p> <p>for 66 cows</p> <p>Wheat bran . . . . . 106.70          Crushed Russian barley . . . . . 71.90          Pea-nut meal . . . . . 85.20          Brewer's grains . . . . . 53.15          Dried sugar beet slices . . . . . 117.00          Dried potato flakes . . . . . 15.30          Best linseed meal . . . . . 43.75          Sesame meal . . . . . —          Palmnut meal . . . . . 5.30          Maltzena . . . . . —          Cottonseed meal . . . . . 23.80</p> <p>522.10</p> <p>6643</p>	<p><b>2. Concentrated food.</b></p> <p>for 48 cows</p> <p>Wheat bran . . . . . 190.90          Crushed Russian barley . . . . . 71.20          Pea-nut meal . . . . . 143.90          Brewer's grains . . . . . 6.60          Dried sugar beet slices . . . . . 41.00          Dried potato flakes . . . . . —          Best linseed meal . . . . . 60.90          Sesame meal . . . . . 20.55          Palmnut meal . . . . . 105.15          Maltzena . . . . . 10.70          Cottonseed meal . . . . . —</p> <p>609.30</p> <p>8425</p>
<p>per head . . . . . 74.07</p>	<p>per head . . . . . 10.36</p>	<p>per head . . . . . 145.26</p>

3 Attendance, etc.		3 Attendance, etc.		3 Attendance, etc.	
Straw for litter, 15 quintals at 2.80 M.	42.00	Straw for litter, 15 quintals at 2.80 M.	42.00	7.5 q. at 2.80 M. 5 q. at 4.80 M.	45.00
Wages, allowances, milk prizes . . . .	45.00	Wages, allowances, milk prizes . . . .	46.00	Wages, allowances, milk prizes . . . .	47.50
Rent of stable: 4% on 500 M. . . . .	20.00	Rent of stable: 4% on 500 M. . . . .	20.00	Rent of stable: 4% on 500 M. . . . .	20.00
Interest on capital expended on cows . .	20.00	Interest on capital expended . . . . .	20.00	Interest on capital expended . . . . .	20.00
Losses (cows) . . . . .	2.30 M.	Losses (cows) . . . . .	1.910 M.	Losses (cows) . . . . .	1.580 M.
Losses (calves) . . . . .	360 "	Losses (calves) . . . . .	240 "	Losses (calves) . . . . .	200 "
Veterinary . . . . .	180 "	Veterinary . . . . .	180 "	Veterinary . . . . .	120 "
	2770		2270		1900
for 66 cows, per head . . .	41.97	for 64 cows, per head . . .	35.47	for 58 cows, per head . . .	32.76
4. Cost of milk.		4. Cost of milk.		4. Cost of milk.	
Upkeep of utensils . . . . .	5.00	Upkeep of utensils . . . . .	5.00	Upkeep of utensils . . . . .	5.00
Wages and expenses per week:		Wages and expenses per week:		Wages and board per week:	
Horse . . . . .	42.00 M.	Horse . . . . .	42.00 M.	Horse . . . . .	42.00 M.
Milk-maid:		Milk-maid:		Wages . . . . .	8.50 "
Wages . . . . .	7.50 M.	Wages . . . . .	7.50 M.	Lodging, firing . . . . .	1.50 "
Lodging, firing . . . . .	1.50 "	Lodging, firing . . . . .	1.50 "	Board . . . . .	6.00 "
Board . . . . .	6.00 "	Board . . . . .	6.00 "		
	52x57.00		52x57.00		52x58.00
= 2 964 M. for 66 cows, i. e. per head . .	44.91	= 2 964 M. — for 66 cows i. e. per head .	46.31	= 3 016 Marks, for 58 cows i. e. per head	52.00
Total . . . . .	554.45	Total . . . . .	579.38	Total . . . . .	656.82
Less value of manure . . . . .	90.00	Less value of manure . . . . .	90.00	Less value of manure . . . . .	90.00
Expense per head . . . . .	464.45	Expense per head . . . . .	489.38	Expense per head . . . . .	566.82
Gross returns . . . . .	478.00	Gross returns . . . . .	516.39	Gross returns . . . . .	580.36
Gain per head . . . . .	13.55	Gain per head . . . . .	27.01	Gain per head . . . . .	13.74

1 kilogram (kg) = 2.2 lbs. — 1 quintal (q) = 220 lbs. — 1 Mark = 11 1/4 d.

- 983 - **The Adaptation of Sheep Farming to Modern Agricultural Methods.** — BORNEMANN in *Illustrirte Landwirtschaftliche Zeitung*, Year 33, No. 43, pp. 397-399. Berlin, May 28, 1913.

The writer points out that extensive sheep-farming for wool is at variance with the modern intensive use of arable land, while intensive breeding of double purpose sheep with fat lamb rearing suits this practice very well and pays even on dear land. He gives as the results to be aimed at: early maturity, fairly homogeneous wool, fertility and deep milking. These are to be obtained by strict selection, and the crossing of German native breeds with English mutton breeds, a second lambing season, and good regular grazing.

- 984 - **The Cost of Keeping a Heifer up to its first Calving.** — 1. STAKEMANN in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 49, p. 593. Berlin, June 18, 1913. — 2. STABILINI, CARLO in *Giornale di Agricoltura della Domenica*, Year 23, No. 25, p. 195. Piacenza, June 22, 1913.

The writers calculate the cost of keeping a heifer up to the time it drops its first calf as follows:

1) Stakemann :	£	s	d	£	s	d
Value of calf . . . . .	1	10	0			
45 days whole milk, 5 $\frac{1}{2}$ quarts per day . . . . .	1	6	6			
20 " " " 3 $\frac{1}{2}$ " " " . . . . .		7	9			
20 " skimmed milk 3 $\frac{1}{2}$ " " " . . . . .		1	6			
60 " " " 5 $\frac{1}{2}$ " " " . . . . .		7	0			
50 " 1 lb. oats; $\frac{1}{2}$ lb. linseed; $\frac{1}{2}$ lb. hay . . . . .		9	3			
250 " 3 $\frac{1}{2}$ lbs. hay; 5 $\frac{1}{2}$ lbs. oat straw; 2 $\frac{1}{4}$ lbs. concentrated foods . . . . .	3	17	3			
100 " 3 $\frac{1}{2}$ lbs. mangolds at 12s per ton, . . . . .		1	9			
Cost during first year . . . . .				8	0	0
200 " 5 $\frac{1}{2}$ lbs. hay; 8 $\frac{3}{4}$ lbs. straw; 2 $\frac{1}{4}$ lbs. concen- trateds. . . . .	4	4	3			
165 " grazing . . . . .	1	19	3			
Service . . . . .		2	0			
Cost during second year . . . . .				6	6	6
Keep during 9 months gestation . . . . .	4	8	3			
Cost during third year . . . . .				4	8	3
For attendance, stabling, etc, for 3 years . . . . .	1	14	6			
Risk of disease, 5 per cent. for 2 years. . . . .		14	9			
General expenses . . . . .				2	9	3
Total cost at calving . . . . .				21	4	0

The writer observes that in herds where the breeding is very carefully attended to the cost may be somewhat higher than the above, while where less care is bestowed it may be somewhat less.

2) *Stablini* :

	£	s	d
Value of calf weighing 88 lbs. at £2 os 4d per cwt . . . . .	1	12	0
213½ gallons of milk at 6.94d per gal. . . . .	6	3	0
8 ¾ cwt hay at 2s 9d per cwt. . . . .	1	4	0
9 ½ cwt. litter at 1s 8d » . . . . .		15	3
14 ¾ cwt. green food at 4 ¾ d per cwt. . . . .		6	0
Attendance and risk . . . . .		12	6
Cost during first year . . . . .	10	13	6
Cost of keep during the succeeding two years . . . . .	9	2	6
Cost of cow at the age of three years . . . . .	19	16	0

985 - The Cost of Production of Wheat. — LAURENT, FELIX in *Société Centrale d'Agriculture du Département de la Seine-Inférieure*, Year 15, New Series, No. 27, pp. 118-125. Rouen, 1913.

The writer calculates the cost of production of wheat for the three different degrees of intensity of farming as follows :

	Extensive culture, per acre			Medium culture, per acre			Intensive culture, per acre		
	£	s	d	£	s	d	£	s	d
Rent . . . . .	19	3	1	5	9	1	12	2	
Taxes . . . . .	3	10		1	10		5	9	
Interest on working capital . . . . .	8	0		12	10		16	1	
Preparation of the soil before sowing . . . . .	19	3	1	0	10	1	2	6	
Farmyard manure . . . . .	1	12	2	1	15	4	1	18	7
Artificial . . . . .	—	—		9	8		19	3	
Seed . . . . .	16	1		17	8		19	3	
Spreading artificial and sowing . . . . .	2	7		4	10		6	5	
Working the soil after sowing . . . . .	1	7		3			1	10	
Cutting and binding . . . . .	9	8		11	3		12	10	
Stooking and carrying . . . . .	6	5		8	0		6	5	
Threshing and cleaning . . . . .	16	1		17	8		12	10	
Delivery . . . . .	2	3		3	3		3	10	
General expenses . . . . .	9	8		10	1		1	4	0
Total expenses . . . . . £	7	0	10	9	11	3	11	4	9
Average crop of straw (cwt. of 112 lbs.) . . . . .	22.3 cwt.			27.9 cwt.			31.0 cwt.		
Value of straw to be deducted . . . . . £	1	7	0	1	13	9	1	18	7
Cost of production of wheat (grain) . . . . . £	5	19	10	7	17	6	9	6	2
Average crop of wheat (bushels of 60 lbs.) . . . . .	21 bu.			30 bu.			37 bu.		
Cost per quarter of wheat . . . . .	45s 10d			42s 2d			40s 0d		

The writer justifies the reliability of the prices given to the several items in the different degrees of intensity of cultivation and draws the following conclusions from the results. Prices of wheat of about 45s per qr. are, in good years, remunerative for the active farmer; but as in calculating the average cost of production only average values may be taken, so must average prices be taken in calculating the profit; the average price of wheat on the Paris Exchange in the years 1902-1911 was 40s 8d per quarter.

Intensive farming is in the production of wheat much more advantageous than extensive farming. Through the continuously increasing yield per unit of area due to the improved methods of cultivation the total production of wheat is yearly increasing. This increase of total production is however hindered by the diminution in the acreage under wheat, due to the transformation of arable land into pastures and meadows and to the change of rotation from the three years' to the four years'.

986 - **The Most Favourable Time for the Yearly Closing of Farm Accounts.** — BACKMAYR-HEYDA, L. v in *Monatshefte für Landwirtschaft*, Year 6, pp. 161-173 Vienna, June 1913

The question as to the most favourable time for closing the yearly accounts of the farm should be examined according to the writer from the following points of view.

1. When is it that the farmer, without neglecting other important matters, can devote his time to book-keeping?
2. What are the objects aimed at by his retrospective accounts?
3. When is it that the farmer has reliable figures concerning the success of his farming which allow of no doubt?
4. How can the yearly balance be made to coincide most favourably with other book-keeping so as to avoid doing the work twice?

The writer then discusses these various points and reaches the following conclusions:

1. In the temperate zone of Central Europe the most favourable time for closing the accounts is the winter, that is to say when vegetation is at a standstill.

2. Through the closing of accounts the farmer can recognise the errors that he has committed in the management of his farm so as to avoid them in future and render his undertaking more profitable. Consequently it will be well to close the accounts after the close of the harvest of the product which has the most decisive effect on the success of the farm.

3. The writer discusses this point at length; he treats of the various phases of the calculation of net returns and lays stress on the great difficulties which attend the valuation of those products which have no sale on the market and of standing crops at different periods of the year. From this point of view the most favourable moment would be that in which the errors in the calculation of net returns due to doubtful valuation of unsaleable produce, of standing crops, etc., would be smallest; this is the case when the local value of these products is at its lowest. But in most farms this moment is not the same for the unsaleable products and for the standing

crops, for just before the harvest the value of the first is at a minimum, while the latter are at their maximum. Considering the increasing difficulties of valuing standing crops the nearer the harvest is, it appears that it would be most advantageous to fix the time of closing the accounts when the stock of unsaleable farm produce is no longer very great and at the same time the value of the standing crops can still be approximately valued by the cost of production.

4. The yearly closing of accounts should also coincide with the drawing up of the estimates for the following year; consequently it should take place at a time when the farmer, on the basis of his stock of produce (wheat, forage and litter) and of the quantities of seeds and manures required by his rotation, can estimate his cash income and outlay. Consequently, and also to avoid doing the work twice, it will be well to close the accounts in winter or at least before the beginning of the spring cultivation.

From these considerations the writer comes to the following conclusions. The yearly closing of accounts cannot be carried out in all farms at the same time, irrespective of their climatic and economic conditions, if a reliable calculation of net returns is desired. In every farm that produces only crops almost exclusively of a nature that allows of their sale in the market, the best time for closing the accounts is shortly after the end of the period during which the chief items are produced and before the beginning of a new period. But also in those farms which produce a greater quantity of products that do not find a ready sale on the markets, it would be well to investigate carefully if there are good grounds for the current opinion, according to which the books ought to be balanced at the end of June, so as to avoid the difficulty of valuing those products which are not easily sold in the market and to have the calculation of the net returns free from all figures due only to estimation.

987 - **The Net Returns of Farms connected with the Book-keeping Association at Königsberg in Prussia.** — GUNGERICH Die Wirtschaftsstatistik der Landwirtschaftlichen Buchführungs-genossenschaft zu Königsberg in Preussen. — *Geographie*, Year 6, No. 15, pp. 338-339. Königsberg, June 5, 1913.

The results of the book-keeping of the farms affiliated to the Königsberg Book-keeping Association for the period 1904-1912, in their relation to income and outlay of cash and net returns per acre of agriculturally utilized land have been collected by the writer in the table on p. 1288.

The average net returns show a great range from year to year; thus for instance the year 1911-12 shows an increase of 160 per cent above the figures of the net returns for 1907-08, and 75 per cent. above the average of the preceding 7 years. Still further apart are the returns of the various farms. From this it may be seen how important it is to estimate the profitableness of a farm and its value according to returns only after a long period of book-keeping.

If the net returns of the last year, 1911-12, be grouped according to the extent of the farms, it will be seen from the following that the net revenue increases inversely with the extent.

Year	Number of farms	Net returns per acre	Receipts per acre	From stock keeping per acre	Sale of produce per acre	Sundries per acre	Expenses per acre	Purchase of live stock per acre	Manures per acre	Foodstuffs per acre	Salaries and wages per acre	Upkeep of buildings and implements, p. acre	Sundries per acre	Wages in kind (wheat)
1904-05	18	18 6	54 4½	29 9	21 5	3 2	37 3½	9 1½	2 4½	3 11¾	11 10¾	3 11¾	5 11½	2 11¼
1905-06	45	16 9	68 3	39 1	17 5½	12 8½	50 9¼	13 6	3 2	5 2	11 10¾	3 11¾	13 1	3 6¼
1906-07	57	19 4½	79 9	44 5½	23 5	11 10¾	59 1½	17 0¾	3 6¼	6 4¾	13 6	5 2	13 6	3 11¼
1907-08	70	11 4½	63 5½	38 5½	15 10½	9 1½	54 9	11 10¾	3 2	6 9	15 5½	4 9	12 8½	4 9
1908-09	74	13 11¼	67 10	38 5½	18 7½	10 8½	55 11½	11 10¾	3 11¾	7 1¾	15 10	4 9	12 3½	5 2
1909-10	89	19 3½	75 9½	42 10½	25 1½	7 6½	57 1½	12 8½	4 4½	7 6½	16 3½	4 9	11 6	4 9
1910-11	96	15 9	73 9½	46 9½	19 10	7 1¾	59 11	13 1	4 9	8 4	16 8	5 2	11 10¼	4 9
1911-12	118	28 9½	90 10½	48 4½	34 11	7 6½	64 3½	13 6	6 9	9 6½	17 0½	5 11½	11 6	5 4½
Average . . .		17 11¼	71 9½	40 10½	22 2½	8 8½	54 9	12 10¾	3 11¾	6 9	14 10½	4 9	11 6	4 4½

Number of farms	Extent: acres	Net returns per acre
22 . . . . .	up to 618	£ 1   11 s   1 ¼ d
49 . . . . .	618 to 1230	£ 1   10 s   0 ¾ d
27 . . . . .	1230 to 1854	£ 1   7 s   3 ½ d
14 . . . . .	above 1854	£ 1   2 s   7 ¼ d

The average net returns give, on capitalizing at the rate of 4 per cent., an average capital value of  $17s\ 10\ \frac{1}{4}d \times 25 = £22\ 6s\ 4d$  per acre, a price which has already been considerably exceeded by recent prices of property.

The income and outlay of cash has increased yearly; the total outlay in the year 1911-12 exceeds that of 1905-06 by 30 per cent. This increase is chiefly due to the higher wages and to the increased use of chemicals. The wages in cash per acre of cultivated land have increased by 30 per cent., and together with the wages in kind (wheat), by 50 per cent. The outlay on manures has risen by 180 per cent. and on foodstuffs by 140 per cent.

This increase of intensity that becomes visible in the increased figures of the cash account has a very satisfactory economic result in the considerably increased production of live stock and of wheat; but the result to private economy is not so satisfactory, because the net returns of the farm have not increased at the same rate as the intensity of farming. The cause of this inequality between the increase of intensity and that of the net returns, in spite of the fact that the prices of the means of production, such as foodstuffs, manures, farm machines and implements, have remained stationary or have even sunk, while the prices of live stock and its produce as well as wheat have considerably risen of late years, are attributed by the writer to the great rise in the prices of landed property and to the fact that the capacity of the managers of farms is not yet on a level with the great demands of intensive farming.

988 - Italian Emigration in 1912. — *L'Agricoltura Italiana*, Year 9, Series 4, Part 10, pp. 297-299. Pisa, May 31, 1913.

The total number of emigrants from all parts of Italy was larger in 1912 than in 1911, the greatest increase in numbers in proportion to population being from the Marches, Calabria, Sicily, the Abruzzi, Basilicata and Latium. As in former years, the emigrants from Northern Italy mostly spread into other European countries, while those from the south chiefly sought their fortunes beyond the seas. Most of the emigrants consist of agricultural labourers, shepherds, day labourers, masons, iron works men and other industrial workers. The better educated classes were poorly represented.

In 1912, 308 140 passports were made out for European countries as against 271 065 in 1911; the surplus, numbering 30 405 individuals, went chiefly to France, Germany and Austria-Hungary. The number of emigrants to North and South America was 399 713 in 1912, as against 260 372 in 1911. In both years the largest numbers went to the United States, the numbers rising from 191 087 to 267 637. The number of emigrants to Canada rose from 9094 to 18 991, of those to Argentina from 32 719 to 72 154, of those to Brazil from 22 287 to 35 562, to Chile, Peru and Bolivia from 1061 to 1530, and to Central America from 1116 to 1438. On the other hand, the number of emigrants to Mexico fell from 1020 to 758, and that of emigrants to Uruguay and Paraguay from 1088 to 1643. Owing to the annexation of Libya, the emigrants to Africa increased by 8332, while 82 and 394 fewer went to Asia and Oceania respectively.

The numbers of emigrants coming from the different districts of Italy in 1912 were as follows:

District	Emigrants to European countries	Over sea emigrants	Total
Piedmont . . . . .	38 556	20 685	65 241
Liguria . . . . .	3 043	5 823	8 866
Lombardy . . . . .	59 059	10 377	75 436
Venetia . . . . .	96 842	17 275	114 117
Emilia . . . . .	27 153	8 616	35 769
Tuscany . . . . .	27 484	13 455	40 939
Marches . . . . .	14 072	18 355	32 427
Umbria . . . . .	11 063	2 978	14 041
Lazio . . . . .	2 688	15 185	17 873
Abruzzi . . . . .	6 123	40 379	46 502
Campania . . . . .	5 491	61 448	66 939
Apulia . . . . .	4 344	28 845	33 189
Basilicata . . . . .	546	14 322	14 868
Calabria . . . . .	1 290	40 033	47 323
Sicily . . . . .	5 514	87 274	92 788
Sardinia . . . . .	4 872	4 259	9 131
Total . . . . .	308 140	407 312	715 452

With a total population of 34 813 975 in 1912, there were 20.44 emigrants for every 100 000 persons in Italy, as against 15.39 in the preceding year.

The emigration to Tripoli rose from 1032 persons in 1911 to 7428 in 1912, *viz.* an increase of 6396.

989 — **The Strikes of Agricultural Labourers in Italy in 1911.** — *L'Agricoltura italiana*, Year 9, Series 4, Part 10, p. 311. Pisa, May 31, 1913.

The number of agricultural strikes and of strikers in the different Regions of Italy in 1911 were as follows.

Districts	Strikes	Strikers
Piedmont . . . . .	12	1 131
Lombardy . . . . .	42	3 029
Venetia . . . . .	13	2 261
Emilia . . . . .	57	104 771
Tuscany . . . . .	~	282
Marches . . . . .	1	?
Umbria . . . . .	5	2 573
Latium . . . . .	6	1 190
Campania . . . . .	1	47
Apulia . . . . .	3	1 000
Sicily . . . . .	6	3 131
Total . . .	148	132 738

In those districts where there were fewest strikes the share system is general, *viz.*, in Campania, the Marches, Tuscany and Latium, while it is comparatively rare in the districts where most strikes occurred: Emilia, Lombardy, Piedmont, etc.

990 - **Ways and Means of Indian Agricultural Development.** — DOBBS, A. C. in *The Agricultural Journal of India*, Vol 8, Part 2, pp. 161-168. Calcutta, April 1913.

The writer is of opinion that the most effectual method of improving agriculture in East India is by substituting for the labour of men and animals the less costly and more efficient assistance afforded by agricultural machines. He hopes, therefore, that the Agricultural Department, which has hitherto been occupied in standardising seeds and popularising the best existing methods of cultivation, will now turn its attention to importing and popularizing agricultural machines, especially steam ploughs and traction engines. In sugar cane districts, the introduction of the steam plough promises excellent results, as the areas under this crop are extensive and the soil requires deep cultivation. An obstacle to mechanical cultivation in many districts is the prevalence of small holdings; here its introduction will have to be left to the operation of economic forces, assisted perhaps by the spread of the co-operative idea. The larger amount of energy available will doubtless be used in elaborating agricultural and forest products.

## AGRICULTURAL INDUSTRIES.

991 - **Buffalo Milk Analysis** (1). — PAPPEL, A. in *The Cairo Scientific Journal*, Vol. VII, No. 78, pp. 63-67 Alexandria, March 1913.

In a communication on the composition and analysis of milk and butter Mr. Lucas pointed out that the interpretation of the analytical results

DAIRYING

(1) See No. 1653, B. Dec. 1912.

(Ed.)

is often difficult owing to the absence of standards based on a sufficient number of analyses of samples known to be absolutely pure.

Being convinced of the necessity of establishing these standards, the writer gives the results of a certain number of his analyses of buffalo milk.

The samples of milk were taken from cows which were examined each time by a veterinary surgeon in order to make sure that the milk analysed was that of healthy and well fed animals and might be considered normal.

Each sample comes from several animals, usually six, and thus represents a normal average milk. The writer hopes it will be possible to have 8 to 10 samples examined in this way each month for at least one year, and if other laboratories would join in this work he thinks it would be advantageous to use the same method everywhere and to express the results in an identical way, so that they can be readily compared. He therefore submits the results of a few analyses together with the method employed.

#### *Specific Gravity.*

Maximum . . . . .	1.0346
Minimum . . . . .	1.0315
Mean for the 14 samples: . . . . .	1.0333

The specific gravity was determined at 15° C., Sprengel's pykuometer being used.

#### *Total solids.*

Maximum . . . . .	18.71
Minimum . . . . .	16.56
Mean for the 14 samples: . . . . .	17.69

The results are given always on 100 grams. The writer describes the three methods he used and which gave results differing only in the second place of decimals.

#### *Fat.*

Maximum . . . . .	8.61
Minimum . . . . .	7.79
Mean for the 14 samples: . . . . .	7.74

Adam's method was employed, using petroleum ether freshly distilled between 45° and 55° instead of ordinary ether.

For routine work Gerber's method can be employed, but as in buffalo's milk the amount of fat is very high, it must be decided at what temperature the volume of fat shall be read. From the analyses made, the writer observed that the reading at 60° agrees better with Adam's method than the reading at 70°.

#### *Lactose.*

Maximum . . . . .	5.05
Minimum . . . . .	4.70
Mean of the 14 samples: 4.89 per cent (calculated as anhydride).	

The gravimetric method was used, the lactose being determined with Fehling's solution, using Soxhlet's modification.

The lactose was also determined with the polarimeter, but this method presents some drawbacks.

#### *Proteins.*

The nitrogen was determined by Kjeldahl's method.

Maximum . . . . .	0.698
Minimum . . . . .	0.587
Mean for the 14 samples . . . . .	0.642

But the factor to be used to convert nitrogen into protein is open to discussion, as enough experiments have not been made to know whether the usual factor 6.3 is correct for buffalo's milk. Using this factor the proteins equal 3.70 to 4.37, and the mean for the 14 samples is 4.04. The writer hopes before long to be able to solve the question satisfactorily.

#### *Ash.*

The figures are obtained by calcination at the lowest possible temperature of 10 c.c. of milk.

Maximum . . . . .	0.84
Minimum . . . . .	0.70
Mean for the 14 samples. . . . .	0.78

In the ash the alkalinity and the chlorine have been determined. The figures obtained are:

#### 1) Chlorine calculated as sodium chloride.

Maximum . . . . .	0.099
Minimum . . . . .	0.070
Mean for the 14 samples: . . . . .	0.078

#### 2) The alkalinity is given in cubic centimetres of normal sulphuric acid:

Maximum . . . . .	7.2 %
Minimum . . . . .	7.6 "
Mean for the 14 samples: . . . . .	8.1 "

#### *Total Solids Not Fat.*

This figure is always used in milk analysis, as differences are chiefly observed in the amount of fat. For the other constituents the differences are not great and therefore the total solids not fat is a nearly constant figure.

Maximum . . . . .	10.33
Minimum . . . . .	9.13
Mean for the 14 samples: . . . . .	9.87

Very often in routine work only the specific gravity and the fat are determined and the total solids not fat are calculated using Fleischmann's formula. But for buffalo's milk the figures obtained with Fleischmann's formula are too high. In studying the figures obtained in the present

analyses the writer found a formula which in all the 14 cases has given a nearer result than Fleischmann's formula, and the application of this new formula is much easier, as no tables are necessary.

The following is a practical example. Supposing a milk has given :

Specific gravity: . . . . .	1.0328
Fat . . . . .	8.6 per cent.

The total solids not fat equal :

$$\frac{32.8}{4} + \frac{8.6}{5} = 9.92 \text{ per cent.}$$

The application of this formula for the 14 samples has given :

Maximum . . . . .	10.11
Minimum . . . . .	9.50
Mean for the 14 samples: . . . . .	9.87

that is to say the same figure as the writer obtained directly.

992 - **The Determination of Fat in Dried Milk.** — RUSCHE in *Molkerei-Zeitung*, Year 27, No 50, pp. 977-978. Hildesheim, July 2, 1913.

The writer recommends for the determination of the fat contained in dry milk the following rapid method, devised at the Berlin Dairy Experiment Station (Versuchsstation und Lehranstalt für Molkereiwesen). Ten cubic centimetres of sulphuric acid (S. G. 1.82), 5 c.c. of water and 1 c.c. of amyl alcohol are carefully poured in layers over each other in a usual Gerber's butyrometer. To this 1.133 gram of milk powder, weighed in a specially divided weighing funnel with rubber stopper, and 5 c.c. of water are added.

After vigorous shaking the butyrometer is left in a water bath at 65 to 70° C. (shaking it from time to time) until the liquid has become clear; then it is centrifugated for 15 minutes. The sample is again put into a water bath at 65° C.; the fat content is read off and multiplied by 10. To make sure that the fat has been completely separated it is well to centrifugate the sample again for 5 minutes after having read off the fat content.

This method has the advantage of being rapid and easy to carry out, it gives a clear separation of the fat and can be used for the most various kinds of dried milk. In order, however, to obtain exact results the process as indicated by the writer must be strictly followed.

993 - **A Comparison of the Acid Test and the Rennet Test for Determining the Condition of Milk for the Cheddar Type of Cheese.** — HASTINGS, E. G. and EVANS, ALICE C. - U. S. Department of Agriculture, Bureau of Animal Industry, Circular 210, p. 6. Washington, April 1913.

In the making of the Cheddar type of cheese it is desirable that the condition of the milk be such that the whey can be drawn from the curd at the expiration of approximately the same time each day. To control this the cheese-maker must be able to ripen the milk to approximately the same point each day. Two tests are employed to determine the ripeness

of the milk, the rennet test is one or other of its modifications, and the acid test or the titration of the milk.

From the work effected by the writers, it is evident that, for the purpose of determining the ripeness of milk for cheese making, the rennet test is superior to the acid test.

994. - **Use of Prickly Pears for Alcohol Production.** - CITTOLINI, SANTE in *Società degli agricoltori italiani, Bollettino quindicinale*, Year XVIII, No. 12, pp. 456-459. Rome, June 30, 1913.

BREWING AND  
DISTILLING

The writer recalls the experimental results obtained some years ago by Dr. Sanna and by Colladel, oenologist at the Oenological School at Cagliari, in their attempt to distil prickly pears (*Opuntia*) which grow in Sardinia without any cultivation. The fruit was small but heavy, averaging 3.6 oz. each, owing to the large number of seeds and the consistency of the pulp. When peeled, crushed, and submitted to pressure, 432 lbs. yielded 26.8 galls. of somewhat viscous juice having a density of 1.0548. Skins represented 37.64 per cent. of the weight and the seeds 4.2 per cent., leaving a little under 59 per cent. for the material to be used for alcohol extraction. The analysis yielded the following results,

Whole fruit:	albuminous substances	6.75 %
	oily	0.2758
	cellulose	1.342
Juice:	extractable material	15.54 %
	acidity.	0.0102
	ash	0.692
	saccharine substances	11.20

It was remarked that the saccharine substances were essentially aldehydic in character and present in sufficient quantity to be distilled economically, whereas the acidity was insufficient.

After a series of trials, the best results were obtained by squashing the unpeeled fruits and putting the pulp thus obtained into bags and subjecting it to high pressure. The lack of acidity was then corrected by the addition of 0.32 oz. of tartaric acid per gallon and the liquid inoculated with a good alcoholic ferment in very active condition. The fermented liquid contained 5.98 per cent. of alcohol, showing that the saccharine material was well utilized. By distillation and subsequent rectification a spirit was obtained with a pleasant ethereal perfume which would make it unsuitable for various industrial purposes. The press cake could be used as stock food. It may be estimated roughly that 100 lbs. of figs will produce 0.6 gal. of alcohol, and taking 120 cwt. of fruit as an average yield per acre, 80 gals of alcohol may be obtained per acre.

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## PLANT DISEASES

### GENERAL INFORMATION

**LEGISLATIVE  
AND ADMINISTRATIVE  
MEASURES**

995 - Measures for the Prevention and Control of Plant Diseases in Italy. —  
*Atti Parlamentari, Camera dei Deputati* (No. 1430-1430 A), *Senato del Regno* (No. 1142-1142 A), 1913.

The Chamber of Deputies and the Senate have approved in the respective sittings of June 14 and 22, 1913 the following law:

Art. 1 — The owners and managers of horticultural establishments and nurseries, who produce or trade in plants, parts of plants, and seeds must notify themselves to the prefect of the province.

The Ministry of Agriculture, Industry and Commerce has the right to cause an inspection to be made of the cultivations and of the produce wherever they be kept, and to prohibit their sale if they should be found to be infected, or to order the necessary disinfection.

Art. 2. — The Ministry of Agriculture, Industry and Commerce may, by means of a ministerial decree:

a) suspend the importation into the Kingdom and the transit through it of plants or plant products if these be found to be infected;

b) determine the ports and the frontier stations through which only is the importation from abroad of living plants, seeds and other plant products allowed;

c) prevent the exportation of plants, parts of plants and seeds from the territory of communes in which the existence of infectious diseases has been ascertained.

Art. 3. — The delegates of the Ministry entrusted with the surveillance of the ports and frontier stations have the right to:

a) enforce the disinfection of plants, parts of plant and seeds which they may consider infected, as well as of the packing cases and any other object which may be a vehicle of disease germs;

b) prohibit the importation into the Kingdom, and transit through it, of plants which they consider infected or bearing germs of disease.

No indemnity is due for the disinfections or the prohibitions mentioned in this article.

Art. 4. — No indemnity is due for the trees, plantations, seeds or other plant products which might be injured or destroyed by the operations

carried out with the object of providing, according to the provisions of the following article 5, for the protection of cultivated plants against disease.

Nevertheless the Ministry may give special subsidies according to the provisions contained in the Regulations, when the destruction of plants, etc., is carried out in the farms of small peasant proprietors, or small farmers who work with their own hands the said farms.

Art. 5. — The delegates of the Ministry of Agriculture, Industry and Commerce have the right to enter into all farms, whatever be the crop or its destination, in order to ascertain the existence of plant diseases and to carry out, as set forth by the present Law and by the special Regulations, the disinfection and cure of the infected plants.

The Ministry of Agriculture, Industry and Commerce, having heard the Commission for the protection of plants against disease, nominated by the Royal Decree of October 25, 1911 (No. 1208) may render compulsory the use of remedies against the diseases of plants and the use of means of control against insect and other plant pests, in cases in which the efficiency of these means depends upon the united action of all those interested in such crops; it may further cause those treatments and destructions which it considers necessary to be carried out at the expense of those who fail or delay in carrying them out themselves.

6. — The owners of lands in which infectious diseases exist may unite in communal, intercommunal and provincial associations (*consorzi*).

The formation of these associations must be promoted by the executive committee (*giunta*) of the communal or provincial council according to whether the association be communal, intercommunal, or provincial, when it is demanded by a number of landowners who represent at least one half of the cultivated acreage for which protection is demanded. The request has to be presented to the syndic in the case of communal associations, and to the president of the provincial council in the other cases.

The constitution of these associations may be rendered obligatory by the prefect after having heard the executive committee or committees of the communes or of the provincial council, according as to whether a communal, intercommunal or provincial association be contemplated, and when the lack of such an association constitutes a disadvantage or a danger to the protection of the interests of the agriculture of the district.

The regulation to be issued for the application of the present law will set forth the rules to be followed for the constitution, administration and working of the associations.

The associations will be empowered to levy, in such a manner as shall be stated in the Regulations, a yearly contribution not exceeding 15 *7d* per acre on those landowners of the district who are concerned.

The provisions of the law for the collection of direct taxes, including the fiscal privileges, shall be applied to the formation of the rolls of contributors and to the collection of their contributions.

The benefits arising from the present laws on the antiphylloxera as-

sociations (consorzi antifillosserici) may be extended to the associations of vine growers formed according to this law.

The antiphylloxera associations constituted according to the laws at present in force may act also for the diseases of other cultivated plants in their respective territories.

The powers considered in this article may in cases of urgency be extended also by a decree of the prefect, after having heard the bodies mentioned in the third paragraph, to associations of landowners which are already regularly formed.

Art. 7. — The State may take steps, at its own expense, for the direction of the work of protection against plant diseases, insects, and other plant pests, whenever it should deem it necessary, considering the nature and importance of the injury. It may also contribute up to one half the amount of the expenses of carrying out the necessary control.

The other half shall be defrayed by the parties concerned, but it may be advanced by the State, against reimbursement in one or more years by means of transfers to the collectors of taxes and of association dues or in such other ways as may be ordered by the regulation.

Art. 8. — Contraveners of the provisions of the present law and of the Regulations which will be issued in conformity with it, shall be liable to fines ranging between 8s and £7 18 s 6 d, without prejudice to further penalties which may be incurred for contraventions of the penal code.

Contraveners of the prohibitions of importation and transit shall be fined not less than 8 s nor more than £11 17 s 10 d, without prejudice to further penalties which may be inflicted in accordance with the customs law on smuggling.

For the determination and definition of such contraventions, the provisions at present in force in the matter of customs are applicable.

Art. 9. — The funds voted in the budget of the Ministry of Agriculture, Industry and Commerce in chap. 40 of the year 1912-13 will be raised, in the same chapter of the year 1913-14 and in succeeding years, to £5470, in order to meet the outlay consequent upon the enforcement of the present law and the engagement of the staff according to Table B (1).

From the year 1913-14 the sum voted in chap. 71 of the budget of 1912-13 will be increased by £475 in order to meet the outlay according to Table A (2).

Art. 10. — The special laws on *Diaspis pentagona* of March 24, 1904, No. 130, and on *Doriphora* of May 30, 1875, No. 2517 (2nd series), are abrogated.

Art. 11. — The Regulation to be issued for the application of the present law will contain provisions for the organization of the services of

(1) Roll of the inspectors of plant diseases.

(Ed.).

(2) Roll of the employees of the Royal Station of Agricultural Entomology at Florence.

(Ed.).

surveillance and warning, and of the prevention and cure of diseases, and for the reimbursement of the sums advanced by the State on behalf of the persons concerned.

**996 – Order in Council on the Introduction of Potatoes into Western Australia.**

Extract from *Government Gazette* of 19th April, 1913.

Whereas by "The Insect Pests Amendment Act, 1898," the Governor by order in Council may from time to time make such regulations as he deems necessary for any purpose for which regulations are contemplated by the said Act, or which he deems necessary for giving full effect to the said Act: Now, therefore, His Excellency the Governor, by and with the advice and consent of the Executive Council, doth hereby revoke the regulations made under the said Act, and published in the *Government Gazette* on the 17th day of November 1911, and doth hereby make the regulations set forth in the Schedule hereto, and doth hereby declare that the said regulations shall come into force on the publication of this Order in the *Government Gazette*.

**REGULATIONS.**

1. All potatoes imported pursuant to the exception contained in the Proclamation made under "The Insect Pests Amendment Act, 1898", and published in the *Government Gazette* on the 19th day of April 1912, must be in new and sound bags branded with the name and address of the grower and the letter "P" not less than six inches long, and must be accompanied by a Government Certificate signed by an officer of the Department of Agriculture of the State from which the potatoes are imported, certifying that such potatoes are sound and were grown on a farm which has been free from Irish Blight for 12 months then last past.

2. All imported potatoes shall be subject to inspection at the port of entry by an inspector under the said Act.

3. The potatoes on arrival at the port of entry shall, at the expense of the importer, be delivered direct into a shed set apart by the Department of Agriculture, for inspection and such other treatment as may be decided upon from time to time by the Inspector or other officer of the Department.

4. The importer or his agent shall, at the importers's expense, provide the necessary labour to open the bags and to re-bag the potatoes, if passed on inspection, and in every way facilitate the inspection.

5. If the Inspector declares any imported potatoes to be diseased, or infected with disease, the importer shall, at the request of the Inspector and at his own expense, disinfect, destroy, or otherwise dispose of such potatoes as the Inspector may direct.

6. Any consignment of potatoes being or having been in contact with any diseased or prohibited consignment of potatoes may be destroyed, disinfected, or otherwise dealt with at the expense of the importer as the Inspector may direct.

7. A fee of One shilling for every bag of imported potatoes shall be charged to defray the cost of inspection and of carrying these Regulations into effect.

8. Imported second-hand potato bags shall be disinfected at the port of entry as follows, namely: By dipping the said bags and keeping them continually submerged for not less than fifteen minutes in a solution of not less than one pound of bluestone to every ten gallons of water.

9. All bags or packages that have contained imported potatoes may be disinfected or destroyed or otherwise disposed of by the Inspector.

10. If any importer or his agent fails or neglects to observe these Regulations, or to carry out the requirements of any Inspector as aforesaid, the Inspector may destroy the potatoes or perform the work at the expense in all things of the importer.

**997 - Outline of Administration in Controlling Insects and Fungi Injurious to Agricultural Plants in Japan.** 32 pp., 1 fig. Tokio, 1913.

The first chapter of this publication of the Bureau of Agriculture, Department of Agriculture and Commerce, of Tokyo sets forth the nature of the task undertaken by the administration of the state in the control of insects and fungi injurious to agriculture. The necessary measures are carried out partly by the Imperial Government, and partly by the local governments. A list is given of the legislative measures and instructions emanating from the above-mentioned authorities.

The second chapter deals briefly with the entomological and pathological work pertaining to injurious insects and plant diseases which is carried out at the Agricultural Experiment Stations.

In the third chapter, are set forth the measures, adopted by Public Communities (self-governing organs from the prefecture to the village) and other Public Bodies, for the control of plant diseases and the special regulations respecting the export of rice, fruits, and plants. The fourth chapter speaks of the instruction in phytopathology given in the governmental, communal or private agricultural schools, and in the institutes of various grades, and mentions the practical results of researches in this direction.

The fifth chapter continues the enumeration of the most important animal and plant parasites and gives the methods of their control.

## DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES  
NOT DUE TO  
PARASITES  
AND OF  
UNKNOWN  
ORIGIN

**998 - An Undetermined Pear Disease.** — PASSY, PIERRE in *Revue Horticole*, Year 85, No. 11, pp. 252-253. Paris, June 1, 1913.

Towards the middle of the summer, the sheath of buds in course of development loses its smooth, almost varnished appearance, and becomes dull; at the same time it takes a purple hue, and subsequently the epidermis becomes slightly warted. If the attack is slight, no further consequences ensue. The following year, the branches again show signs of the disease,

the epidermis is purple and wrinkled. If lateral fruits occur they exhibit, shortly after the fall of the flowers, superficial scars covered with a somewhat wrinkled, suberous skin.

But the disease can assume a more serious character. From the first year, the attack can be more severe; and after the above changes have become very apparent the leaves of the buds cease developing and the lengthening of the bud axis is suddenly arrested, the dying off beginning at the top of the bud. The older branches which had not suffered much at first, become perforated and cracked; their appearance presents some analogy to that of victims of "lenticure", but in this case the cracks are usually longitudinal. Further, this cracking of the branches can be more marked, penetrate deeply and sometimes cause the death of old branches. Trees thus attacked grow very little, and if any fruits survive, they are much perforated and cracked; as a rule, they cannot develop, but turn black and are quite useless.

If, in the hope of saving a diseased tree, it be closely pruned, and all the visibly affected portions are removed, the buds which subsequently develop are attacked in their turn, and infected trees seldom, or never, recover.

The writer has observed this disease for more than 15 years, though it has never before been recorded. The cases were at first isolated, but are now increasing: one row of 20 espalier "Doyenne du Comice" trees planted two years ago has been completely attacked. In spite of the researches which have been made to determine the cause of this disease, the pathogenetic agent is still unknown. The writer, however, thinks that we have here to do with a real parasitic disease, probably due to a bacterium. He bases his opinion upon the progress of the disease, its persistence on the trees infected, the visible modifications of the branches, and the reappearance of the malady after the removal of the diseased branches.

The disease shows itself alike upon trees planted on dry and on damp soil. The writer has observed it not only in the immediate neighbourhood of Paris, but elsewhere, many badly diseased trees being found in a consignment from Normandy.

The writer will continue his researches on the disease.

## BACTERIAL AND FUNGOID DISEASES.

999 - Experiments in Spraying Peaches and Vines in 1912 (1). — PANTANELLI, E. in *Le Stazioni sperimentali agricole Italiane*, Vol. XLVI, Part 5, pp. 329-346. Modena, 1913.

MEANS OF  
PREVENTION  
AND CONTROL

Liquid concentrated polysulphides of calcium and barium kept in hermetically sealed receptacles and diluted just before use, *i. e.* polysulphides as supplied by the trade, have proved in the course of experiments made in Latium in 1912, to be efficacious in the control of

(1) See also No. 1194, B. July 1912.

(Ed.).

*Exoascus deformans*, peach leaf-curl, but quite useless in the case of *Plasmopara viticola* which attacks the leaves, flowers, and fruit of the vine. Unlike the polysulphides prepared on the spot and immediately applied, these diluted concentrated polysulphides do not scorch the peach leaves, nor cause them to fall; they did, however, in one case scorch the youngest buds of some vines.

Scott's self-boiled lime-sulphur mixture (1) is efficacious as a spring remedy against *Exoascus deformans*, and was always useful in preventing peaches from being attacked by the rot due to *Monilia cinerea*.

Suspensions of iodide of copper are almost useless against *E. deformans* and cause many of the leaves to fall, but do not produce any visible scorching; suspensions of iodide of silver, on the other hand, are efficacious, and were it not for their prohibitive cost, would be to be recommended on account of the ease with which they are prepared.

Silver soap emulsion (Vermorel and Dantory's formula) was of little use in 1912 in checking vine mildew (*Plasmopara*), while it had the disadvantage of being costly and slow to prepare, as the soap is difficult to dissolve.

The application of a suspension of "cuprosa" powder (the trade name for powdered oxychloride of copper prepared at the Bex factory) and of a wash made with Caffaro's "Pasta elettrocupriferà" (consisting chiefly of oxychloride of copper, but also containing lime and a considerable amount of water) were equally efficacious in checking vine mildew. The former has the advantage of being more quickly and accurately prepared; the latter, however, costs less than half as much. Both are good remedies against mildew, but give a rather smaller crop of grapes than is obtained with Bordeaux mixtures, as they have little or no stimulating effect upon the growth of the vine.

Comparing the results of 1912 with those obtained previously, the writer comes to the conclusion that Bordeaux mixture is to be preferred among washes containing copper, and cannot be replaced by sulphur mixtures, unless it be polysulphides (especially polysulphides of calcium) prepared on the spot and immediately applied. For this purpose all the more or less concentrated, solid or liquid polysulphides, which now begin to flood the market, are not to be recommended. On the other hand, dilutions of ready-made commercial polysulphides of calcium and barium may be used for the spring treatment of peach trees as a remedy against *Exoascus deformans*.

(1) See Nos. 1534-1535, *B.* May 1911 and No. 423, *B.* Feb. 1912.

(Ed.).

## PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

1000 - Conservation of Vitality in the Seeds of Weeds buried deeply in the Arable Layer of Soil periodically tilled. — MUNERATI, O. and ZAPPAROLI, T. V. in *Le Stazioni sperimentali italiane*, Vol. XLVI, Part 5, pp. 347-371, 1 fig. Modena, 1913.

PARASITIC  
AND OTHER  
INJURIOUS  
FLOWERING  
PLANTS

The writers, with the object of imitating as much as possible natural conditions, did not use in their experiments the porous pots used by other experimenters (Duvel, Snell, Dorph-Petersen). They placed the seeds at various depths, excavating small square holes and filling them up with the soil from the field, after having placed a cross of iron wire at a short distance above the seeds so as to be able to find them again easily.

The observations made enable the writers to state that, for the seeds of the great majority of cultivated or spontaneous plants, both those with teguments easily permeated by water and those having this quality in a lesser degree, "the power of conserving vitality possessed by seeds buried in the soil is strictly dependent upon the actual germinative faculty or readiness to germinate which they have at the moment when they are buried".

In other words, and speaking generally:

1) The readier a seed is to sprout at a determined time, the less will it preserve its vitality in the soil, irrespective of the depth at which it be buried. The seeds of most cultivated species that have an immediate germinative faculty, do not remain alive in the soil: to such an extent is this true that if they were left to themselves in the fields such species would soon disappear.

2) The longer the seeds of a given species keep in a condition unfavourable to germination, even under the most favourable conditions of moisture, air and warmth, the longer will these seeds remain alive in the soil, whether they be near the surface or ploughed deeply under.

3) The expression "Seeds that have rapidly lost their faculty of germinating in the soil" does not give a true impression of the facts as they take place in the soil. A seed may lose its germinative faculty out of the soil also and in surroundings in which most important factors for its evolution, namely water, be lacking. On the contrary it should be said, for cultivated and wild plants: "Seeds that sprouted soon in the soil and immediately died, or seeds which lost their vitality before germinating".

4) The power that the seeds of wild plants have of remaining inactive in the presence of the factor water changes more or less rapidly with time. The seeds with hard teguments gradually lose the faculty of preventing the admission of water, and in other seeds, those conditions which allow water to perform its function of mobilizing matter successively gain ground. The slower a seed is to react to water, either in a granary or at a greater or

less depth in the soil, the more will the species be a pest. As soon as the seed of a wild plant ceases to oppose its primitive resistance to the action of water, its power of conserving its vitality in the soil does not differ from that of the seed of any cultivated plant. This is the reason of the fact that in the cultivated layer, germinating seeds are found at considerable depths and as much as one to two years after when they were buried.

5) In the long run the seeds remaining at a depth and not germinating end by finding in their forced habitat a state of equilibrium which would allow them to preserve their vitality almost indefinitely, but in normal conditions the implements of tillage interfere in time with this equilibrium.

6) The seeds which preserve their germinative faculty in the soil, even if actually in condition to germinate easily, are those which require the action of light also in order to germinate: typical of this kind, among weeds, is charlock (*Sinapis arvensis*).

The lack of one or the other of the three factors, oxygen, moisture and warmth, which are commonly considered as determinants of the process of germination, is not sufficient explanation of the conservation of the vitality of seeds, because a covering of only a few inches of soil has the same protective action as a layer of 14 to 16 inches and upwards. Meanwhile, either the seeds can germinate without light (and this is the case of most weeds of the lower valley of the Po) and then their germination will take place more or less regularly both in the superficial and in the deeper layers of the arable soil; or they require light and then they must remain wholly on the surface of the soil, because even a very slight tilling of the soil would prevent their germinating.

7) In practice, superficial or deep tilling of the soil, even if done frequently, has but a limited effect in the control of those weeds that are multiplied by seeds. If the seeds of weeds are not effectively prevented from ripening and falling to the ground, the control of weeds runs in a vicious circle and remains one of the most serious and difficult problems of intensive agriculture.

## INSECT PESTS.

### GENERALITIES

1001 - *Scydmaenus chevalieri* n. sp. in Senegal. — VUILLET, A. Description d'un *Scydmaenus* nouveau du Sénégal (Col. *Scydmaenidae*). — *Bulletin de la Société entomologique de France*, 1913, No. 9, p. 238. Paris, 1913.

The writer describes as new to science and under the name *Scydmaenus chevalieri*, a small beetle discovered at Kaolack (Senegal) by A. Chevalier. The beetle was found in fields of pea-nut (*Arachis hypogaea*), where it appeared to live on the underground fruits of this plant.

1002 — **Septicaemia Produced by *Bacillus Melolonthae* and *B. Bombycis* in Cockchafers and Silkworms** — CHATTON, EDOUARD Septicémies spontanées à coccobacilles chez le Haricot et le Ver à Soie. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 22, pp. 1707-1709. Paris, June 2, 1913.

In May 1912, the writer carried out some experiments on the pathogenic action of *Bacillus acridiorum* Herelle (1) on cockchafers; these at once showed signs of being affected by the virus, inoculated by punctures made in the body cavity, and died between 24 and 48 hours after the operation. After having been attenuated by being used successively on ten different subjects without any intermediate culture, the virus, having remained pure, killed its victims in 12 to 24 hours, the average number of surviving females exceeding that of the males. But even the most virulent virus did not kill the cockchafers or even infect them if it only entered the insect by way of the mouth.

At the outset of the experiments, the writer noted the existence of a septicaemia in the cockchafer due to *B. melolonthae*, which, though related to *B. acridiorum*, exhibits many points of difference both morphological and cultural, being larger than the latter and showing fluorescence when cultivated for 5-6 days on agar, also having a pathogenic action on silkworms. In fact, while the larvae of the latter enjoy complete immunity from *B. acridiorum*, *B. melolonthae* when injected appears as toxic to them as to cockchafers, though innocuous to both insects when merely ingested.

*B. melolonthae*, when of spontaneous origin, i.e. not cultivated artificially, if injected into the body cavity of a cockchafer, kills it within 12 to 36 hours; if made more virulent by repeated cultures the virus destroys the insect always in less than 24 hours. The few cases of infection by ingestion recorded in the experiments have not been tabulated and their percentage is not greater than that of the spontaneous cases, viz. a mean of 5 a day. Moreover, 75 per cent. of the healthy cockchafers have *B. melolonthae* present in their digestive tubes, sometimes in dense cultures, and the parasite is invariably present in cockchafers suffering from septicaemia. The infection of the blood seems therefore to originate in the intestines and the parasite which is habitually present in the alimentary tract of the cockchafer, does not pass into the body cavity except under special conditions which are at present unknown. If taken from the intestine and inoculated directly or after culture into the body cavity, it produces septicaemia.

The writer also found another septic bacillus (*B. bombycis*) in the silkworm, which caused a daily mortality of 5 to 10 in a brood of 2000. It has the morphological characters of *B. melolonthae* but does not produce fluorescence in agar; its virulence distinguishes it from *B. acridiorum*. Like *B. melolonthae*, *B. bombycis* kills a silkworm in 12 to 24 hours after inoculation into the body cavity, and the writer was able to get infection by ingestion in the case of 4 individuals out of 27. It seems therefore to be more virulent than the two first-mentioned bacilli. It is, moreover,

(1) See No. 730, B. April 1912.

(Ed.).

much less common in the digestive canal of healthy silkworms than is *B. melonithae* in that of the cockchafer.

The disease produced by *B. bombycis* does not yet seem to be included amongst those that destroy silkworms. Until the death of the latter, no characteristic external signs of infection are visible. The writer proposes the name of "cocco-bacillosis" for this disease.

1003 - **New Ichneumonidea Parasite on Leaf-Mining Diptera.** — GAHAN, A. B. in *The Canadian Entomologist*, Vol. XLV, No. 5, pp. 145-154. London, 1913.

A systematic description of 5 new species of the genus *Opus* (*O. utahensis*, *O. suturalis*, *O. aridis*, *O. bruceipes*, *O. succineus*) and of 2 new species of the genus *Dacnusa* (*D. scaptomyzae*, *D. agromyzae*) recognized as parasites of Diptera (*Agromyza parvicornis*, *A. pusilla*, *Agromyza* sp., *Scaptomyza flaveola*, *A. angulata*) living at the expense of the leaf parenchyma of various plants in different parts of the United States of America.

1004 - **Anagrus flaveolus** Waterhouse, a Parasite of *Peregrinus (Delphax) maidis*, the Corn Leaf-Hopper, in Trinidad. — WATERHOUSE, CHARLES O. On a new species of Mymaridae from Trinidad. — *Bulletin of Entomological Research*, Vol. IV, Part I, p. 87, 1 fig. London, 1913.

This paper gives a detailed description of *Anagrus flaveolus*, which was bred from eggs of *Peregrinus (Delphax) maidis* in Trinidad.

The Editor of the *Bulletin of Entomological Research* notes that *A. flaveolus* is extremely closely allied to *A. frequens* Perkins, originally described from Hawaii, and *A. columbi* Perkins, from Columbus, Ohio, being intermediate between them. The three forms may be local races of a single species. *A. frequens* has a wide range and attacks four different genera of leaf-hoppers in Hawaii, including *Peregrinus maidis*.

1005 - **The Red Clover Gall Gnat (*Amblyspatha ormerodi* Kieffer).** MACDOUGALL, R. STEWART in *The Journal of the Board of Agriculture*, Vol. XX, No. 3, pp. 225-230, figs. 1-6. London, 1913.

During the winter of 1912 and the succeeding spring, there was a great destruction of red clover (*Trifolium pratense*) in England. The counties which suffered most were Norfolk, Suffolk, Essex, Lincoln, Huntingdon, Cambridge, Surrey, Hereford and Shropshire. In practically all the samples received, red maggots (belonging to a Cecidomyid) were found, either in the soil surrounding the plants, or, on dissection, in the spoiled plants. The writer bred out a number of adult flies from the diseased plants, which he submitted to Professor Kieffer, who identified the new fly as belonging to the genus *Amblyspatha* and the species has been named *ormerodi* Kieffer; other animal and plant parasites were also found on the diseased clover, the most important being the fungus *Sclerotinia sclerotiorum* and the eelworm *Tylenchus devastatrix*, the latter fairly common.

From the large numbers of the Cecidomyid larvae, and the position of many of them, *A. ormerodi* can scarcely be regarded as other than a direct and distinct enemy of red clover. It is worthy of note, as a preventive measure, that it was observed that there was no disease on the part of the field which had been fed off closely by sheep, while the plants in the other part

were badly attacked. After the harvesting of the cereal crop, when the conditions are such as to lead to a strong growth of clover, and therefore offer suitable plants on which the midges can lay their eggs, it would be wise to have this clover cut, or eaten off by sheep.

Badly infested plants should be ploughed in deeply in order to prevent the larvae and pupae reaching the surface again. Plants that look poor in winter may recover, for red clover is hardy, and can withstand considerable attack. This was proved by the writer who grew some of the diseased specimens of red clover sent to him for examination.

1006 - **Turnip Moth Larvae injuring Tobacco in Hungary.** — GRÓF, BÉLA in *Magyar Dohányvás*, Year XXX, No. 11, pp. 3-4. Budapest, June 5, 1913.

Early in June, 1911, the writer found some diseased tobacco plants in the fields of the Tobacco-Growing Experiment Station at Debreczen; the leaves showed yellow spots, whose shape and position suggested the presence of a fungus. These spots were at first round, but later became angular; they occurred very regularly along the side veins of the lower leaves; they increased in number and spread to about half an inch in diameter; on some of the leaves they formed large yellow areas.

As a microscopical examination failed to reveal any fungus action, the roots were examined; here larvae of the turnip moth (*Agrotis segetum* Schiff), were found, tunneling in the ground about two inches below the surface and destroying the roots one after another.

To get rid of the larvae, a search was made at two or three inches below the surface at the roots of all plants showing the first signs of the disease.

1007 - ***Pseudococcus nicotianae* n. sp., a Scale Insect Injurious to Tobacco in Italy.** — LEONARDI, G. Cocciniglia dannosa al tabacco. — *Bollattino tecnico della coltivazione dei tabacchi pubblicato per cura del R. Istituto sperimentale in Scafati* (Salerno), Year 12, No. 2, pp. 75-80, figs. 1-4. Scafati, March-April 1913.

A systematic description of *Pseudococcus nicotianae* n. sp. made from specimens sent to the writer by the Director of the Royal Experimental Station for Tobacco Growing at Scafati (Salerno). This new scale insect does not appear to be of Italian origin, for its presence in Scafati coincides with the introduction from Germany of its host plant, *Nicotiana colossea* Andr. (1). Further, until the present time, the presence of the insect had not been recorded at Scafati, or elsewhere in Italy. *Pseudococcus nicotianae*, though confining its attacks to specimens of the variety of tobacco with which it was introduced, and to a kindred variety, *N. macrophylla colossea*, does a good deal of injury to these plants, whether they be wintering in greenhouses or growing in the open.

(1) According to the *Index Kewensis*, *Nicotiana colossea* Ed. André is a synonym of *N. tomentosa* Ruiz and Pav. (Ed.).

1008 - **Pumpkin Beetles and how to destroy them.** — JARVIS, E. in *The Queensland Agricultural Journal*, Vol. XXX, Part V, pp. 326-333, plates 51-52. Brisbane, 1913.

The genial climate of Southern Queensland is eminently suitable to the growth of pumpkins, marrows and other *Cucurbitaceae*, which flourish luxuriantly in almost any situation, and as a rule, require little or no attention. Unfortunately, however, these plants are subject to the attacks of insect enemies, which not only devour the foliage and flowers, but frequently kill seedlings and young plants.

These pests the writer describes, together with their host-plants, life-histories, and the best methods of control (1).

The most destructive is *Aulacophora olivieri* Guérin (the banded pumpkin beetle), though *A. wilsoni* Baly (the plain pumpkin beetle), *A. Cartereti* Guérin (the northern banded pumpkin beetle), and *Epilachma 28-punctata* Fabr. (the 28-spotted ladybird beetle) also attack *Cucurbitaceae*.

1009 - **Some New and Unusual Insect Attacks on Fruit Trees and Bushes reported in England in 1912.** — THEOBALD, F. V. in *The Journal of the Board of Agriculture*, Vol. XX, No. 2, pp. 106-116, figs. 1-2. London, May 1913.

Several interesting attacks of insects on fruit trees and bushes have to be recorded for 1912. Amongst those of special interest is an Apple-leaf Sawfly (*Lygaeonematus moestus* Zaddack) not previously recorded as British, and two aphides which have not hitherto been described: the Delicate Strawberry Aphis (*Myzus fragariae*) which attacks strawberries, and the Northern Currant Aphis (*Rhopalosiphum brittenii*) a parasite on currants. It is also interesting to note the change of host plants by two other insects, the Beech Orchestes (*Orchestes fagi*) recorded as feeding on apples in Devonshire and the Ash and Willow Scale (*Chionaspis salicis*) attacking currants at Woburn and Wye.

Three well-known insects are also recorded for the first time as attacking fruit in Great Britain: the Garden Chafer (*Phyllopertha horticola*) on apples, the V-Moth (*Halia wavyaria*) on currants and gooseberries, and *Pseudococcus aceris* Signoret, the Sycamore Coccus, on apple trees. A new Capsid Bug (a species of *Atractonotus*) on apples in Suffolk and Hereford is also worthy of notice. The number of *Capsidae* attacking apples is gradually increasing.

In addition to describing the above-mentioned species which are of especial interest, the writer gives an account of three other parasites which have been recorded previously to 1912: the Pear Leaf Curling Midge (*Cecidomyia pyri*, Bouché) attacking the leaves of the pear; the Dark Green Ribes Aphis (*Aphis grossulariae* Kaltenbach) which deforms the top shoots of gooseberries and currants; and *Epetimerus* sp. found on apple leaves.

. 1) See also No. 2363, B. July 1911.

(Ed.).

1010 - Notes on Scale-Insects (*Coccidae*): Part I. NEWSTEAD, R. in *Bulletin of Entomological Research*, Vol. IV, Part I, pp. 67-81, figs. 1-11. London, 1913.

Amongst the scale insects enumerated by the writer in this first list, the following are of special interest:

*Icerya purchasi* Maskell, a new pest for Zanzibar, where it is found on oranges and other species of citrus.

*Dactylopius* (*Pseudococcus*) *obtusus* Newstead, common in Zanzibar, especially on the leaves and fruit pedicels of the mango (*Mangifera indica*). Judging by its enormous numbers, this insect must cause serious injury to the plants it infests.

*Ceroptastes conformis* n. sp., taken on *Ficus* sp. in the Botanic Gardens of Entebbe, Uganda. *C. Ugandae* Newstead, found on *Anona muricata* at Entebbe.

*Lecanium* (*Saissetia*) *oleae* (Bernard), in the same locality on the hard wood of an un-named tree. All the examples were abnormally swollen by the attacks of Chalcid parasites. *Lecanium* (*Saissetia*) *nigrum* Nietner, also found at Entebbe, abundant on the leaves of *Anona muricata*. *Aspidiotus gowdeyi* n. sp. occurred in the same locality and on the same host plant.

*Chionaspis unilateralis* on the leaves of a palm (*Thrinax*) in Barbados.

*Leucaspis riccae* Targioni - Tozzetti, new for Egypt (Cairo), where it was found on the cultivated olive, which seems to be its chief host plant. It is certainly an injurious species, and has been previously recorded from France, Italy, Greece and Cyprus.

*Mytilaspis* (*Lepidosaphes*) *beckii* (Newman), better known under its old name *Mytilaspis citricola* Packard, on orange trees at Zanzibar.

1011 - Cicadas (*Melampsalta incepta*) damaging Peach. — FROGGATT, WALTER W. Cicadas as Pests. *Melampsalta incepta*, Walk. — *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 4, pp. 341-344, 3 figs. Sydney, 1913.

Early in November, 1912, several orchards in the Penrith district (New South Wales) were infested with a small black cicada, afterwards identified by the writer as the common wattle cicada (*Melampsalta incepta* Walker), which completely covered many peach trees. The punctures made by the insects in the bark of the trunk and branches had caused them to gum all over and had done serious damage to the trees. Under a square inch of bark removed from a badly infested branch, the writer counted 45 punctures, and this was a fair average of the condition of many feet of the trunk and branches of a number of trees in this orchard at Kingswood, which was one of the first to be invaded by *Melampsalta*. The cicadas swarmed into the orchard on November 7 and remained for about 10 days; at the time of the visit of the writer, November 21, there was only an odd insect here and there on the trees.

On October 26, several specimens of the pest were forwarded from Dapto on the South Coast, where it was doing much harm to the fruit trees.

*Melampsalta incepta* was described by Walker in 1850 in South Australia, but it has now a very extended range right round the coast, through

Victoria and New South Wales into Southern Queensland, and in 1912 it was very plentiful in several localities near Melbourne.

- 1012 - *Ceronema africana* sp. n. on *Caesalpinia pulcherrima*, and *Dactylopius (Pseudococcus) virgatus* var. *madagascariensis* on *Ficus* sp. in Northern Nigeria. — MACFIE, J. W. SCOTT. On a new African species of Coccidae. - *Bulletin of Entomological Research*, Vol. IV, Part I, pp. 31-34, figs. 1-3. London, 1913.

The writer gives a detailed description, under the name of *Ceronema africana* sp. n., of a scale insect found on the "Pride of Barbados" (*Caesalpinia pulcherrima* Sw), a prickly shrub growing to a height of 5 to 10 ft., which, on account of its showy red or yellow flowers, is a favourite in the gardens and compounds of Nigeria. This is apparently the first recorded occurrence of this genus in Africa.

The writer also mentions *Dactylopius (Pseudococcus) virgatus* var. *madagascariensis* Newst., as occurring plentifully on the young hoots of a tree called by the natives "chedia" (*Ficus* sp.). This insect has been recorded elsewhere as feeding upon cactus, coconut palm, cotton, violets, etc., and the species is also apparently new to the continental African fauna.

- 1013 - *Icerya purchasi* and *Novius cardinalis* in the Province of Beira Baixa (Portugal) (1). — MENDES, C. Aparecimento da *Icerya purchasi* e *Novius cardinalis* em S. Fiel. — *Broteria*, Vol. XI, Zoological Series, Part. II, p. 146. Salamanca, June 1913.

In 1910, at the beginning of the summer, a large number of *Icerya purchasi* were observed on the trunks and branches of *Acacia melanoxylon*, on the farm belonging to the Collegio of S. Fiel (Beira Baixa). The orange trees on the same farm and in the neighbourhood remained entirely immune; this scale insect, however, attacked the acacias in large numbers. Shortly afterwards in the same district, the presence of *Novius cardinalis* was recorded for the first time, and within a year all the *Iceryae* were destroyed by this natural enemy.

Researches as to the origin of the disease brought to light the fact that at Castello Branco, 12 miles from S. Fiel, *Icerya* had attacked some oranges which were thereupon thrown into the dust-bins. Shortly after this, the acacias were attacked by the scale insect.

- 1014 - The Red Spider on Cotton. — MC GREGOR, E. A. — U. S. Department of Agriculture, Bureau of Entomology, Circular No. 172, pp. 22 + figs. Washington, May 17, 1913.

A red spider (*Tetranychus bimaculatus* according to Harvey and Banks; *T. telarius* according to Morgan and Berlese) appears to be becoming a serious cotton pest in the United States. It is now prevalent throughout the cotton belt. Seasons of excessive drought are favourable to the development of the mite, and at such times the pest increases so rapidly that the damage often becomes severe before its presence is detected.

With the exception of an outbreak in Louisiana in 1893 no severe occurrence of red spider on cotton had been reported until 1903, at which time

complaints of damage came from S. Carolina and Georgia. In 1905 it caused serious injury in the above States, in N. Carolina and in Alabama. Since then its presence has been established from Maine to Florida and westward to California, as well as in the Hawaiian Islands. With the exception of western Colorado and portions of California no complaints of an alarming nature regarding this pest have come to the writer's attention other than from the south-eastern portion of the cotton belt.

A detailed description of the insect in its various stages may be summarized as follows: The female lays 50 to 60 eggs on the under surface of the leaves. The eggs are perfectly round and colourless, and during the warmer months they hatch in about 4 days after being laid. Each of the larval periods (with six legs) and of the primary and secondary nymph (with eight legs) lasts in summer two days. Almost immediately on becoming adult the red spiders mate and begin egg laying. In South Carolina the time required for a single generation is 10 or 11 days throughout the summer months; in a year there may be about 17 generations.

The colonies of the parasite live on the under surface of the cotton leaves, and where the spiders are very abundant the web may become quite conspicuous. Feeding continues throughout the period of egg laying, causing the appearance of a wine-red spot on the upper surface of the leaf; as the leaves become badly infested they redden over the whole surface, become distorted and drop, often causing the death of the plant.

When cotton dies or becomes untempting in the late fall the red spiders seek more suitable food plants. Up to now they have been seen upon over 90 species of plants. Throughout the active season they are common upon beans, cowpeas, dahlia, ironweed, Jerusalem-oakweed, Jamestown weed, okra, tomato, wild blackberry, wild geranium, pokeweed and English violet. It appears, however, that the greatest number of red spiders that pass the winter do so on the two latter plants.

Heavy and long-continued rain works havoc to the red spiders and early and late frosts destroy the young stages and probably some adults also. On the other hand the insect enemies of the mites succumb more easily to minimum temperatures than do the mites themselves, whence very cold winters are often followed by severe infestations.

Hot weather, although favouring red spider development, probably encourages even more the increase of insect enemies, of which several have been observed. The following are the most important observed at Batesburg, S. C., in 1912: *Arthrocnodax* sp. (Itonidae); *Triphleps insidiosus* Say (Anthecoridae); *Chrysopa quadripunctata* Burm.; *Euthrips fuscus* Hinds., and *E. occidentalis* Pergande; *Scolothrips sexmaculatus* Pergande; *Coccinella 9-notata* Hbst.; *Hippodamia convergens* Guér.; (*Scymnus*) *Stethorus punctum* Lec.

As means of prevention and control the writer recommends:

1. *Clean culture*.—Namely the destruction of weeds and plants which breed the pest. Pokeweed, Jerusalem-oak weed, Jamestown weed, wild blackberry and all border weeds and underbrush about fields should be burned or grubbed out.

**ALFREDO RUGGERI**, gerente responsabile.





